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ABSTRACT

The majority of this publication is comprised of 13 feature articles covering a wide range of topics in the areas of educational technology and library and information sciences. Also offered are related abstracts found in the ERIC Database and the latest news at the ERIC Clearinghouse on Information & Technology, including the publication of its most recent books and ERIC Digests. The feature articles are: "Data about Data: The Heart of Gem" (Stuart Sutton); "Information Professionals Chart Future of Internet Q & A" (Joann Wasik); and "A Study of Digital Reference in a Federal Agency" (Joanne Silverstein); "Confessions of an Online Distance Educator" (Donald P. Ely); "Teachers and Librarians--Closing the Digital Divide" (Patricia Senn Breivik); "S.O.S. for Information Literacy: A Tool for Enhancing Information Skills Instruction" (Ruth V. Small; Marilyn P. Arnone); "The Challenge 2000 Multimedia Project: Fostering Project-Based Learning with Multimedia" (Michael Simkins); "The WEB Project: Technology Innovation in Rural Vermont" (Fern Tavalin); "Generation www.Y: Students as Change Agents" (Dennis Harper); "Smiling While Guiding Thirty Sixth Graders through Internet-Based Curricula When the Internet Is Down (And Other Lessons Learned with One Sky, Many Voices Projects)" (Nancy Butler Songer; Scott McDonald); "Technology in the Mathematics Classroom: Guidelines from the Field"(Shelley Goldman); "Modeling Instruction in High School Physics" (James Hathaway; Shayna Nardi; David Hestenes; Jane Jackson); and "The Maryland Virtual High School CoreModels Project: Harnessing Computer Modeling for Scientific Inquiry" (Mary Ellen Verona; Susan Ragan). (AEF)

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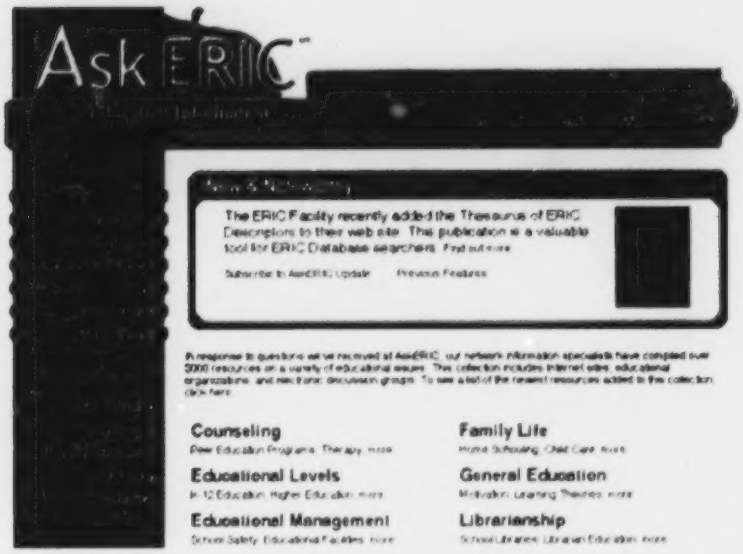
AskERIC Redesigns its Web Site


AskERIC
The ERIC Facility recently added the Thesaurus of ERIC Descriptors to their web site. This publication is a valuable tool for ERIC Database searchers.
Counseling
Family Life
Educational Levels
General Education
Educational Management
Librarianship

The AskERIC Web site (http://www.askeric.org) has a new look. The newly redesigned Web site, which was launched February 2, 2001 features links to some 3,000 Internet sites, mailing lists, organizations and discussion groups that serve the education community; more than 1,500 lesson plans; answers to some 120 frequently asked questions; and the new AskERIC Update, a monthly electronic newsletter that will contain the latest information about AskERIC.

AskERIC is a personalized Internet based service providing education information to teachers, librarians, counselors, administrators, parents and anyone interested in education throughout the United States and the world. AskERIC is a special project of the ERIC Clearinghouse on Information & Technology at Syracuse University.

The Web site will continue to house the AskERIC Question and Answer service and the ERIC Database, the world's largest source of education information. AskERIC's Web-based search engine enables users to search more than one million abstracts of documents and journal articles on education research and practice found in the

database.

The project to redesign the AskERIC Web site began last summer, says Pauline Lynch Shostack, AskERIC coordinator: "The redesigned Web site is the result of our efforts to provide users with easier access to the information that is available on the site and to share the accumulated knowledge of the AskERIC information specialists who have been finding answers to education questions and issues since 1992."

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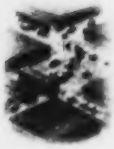
ERIC Feature Articles

Data About Data: The Heart of GEM (by Stuart Sutton)

Information Professionals Chart Future of Internet Q & A (by Joann Wasik)



A Study of Digital Reference in a Federal Agency (by Joanne Silverstein)

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Data About Data: The Heart of GEM

by Stuart A. Sutton

Each month, nearly two million teachers, parents, and school administrators visit the Gateway to Educational Materials (GEM) on the Web to find learning objects (resources) quickly and effectively. [1] However, few visitors to GEM are aware of the research and development (R&D) that both define what GEM is today and chart where it will be tomorrow. In this article, I will talk about the current work of the GEM R&D team and show how that work will improve how GEM functions for teachers and learners around the world.

At the heart of what makes GEM work is what is called structured metadata. The term metadata has been defined quite simply as "data about data." The notion of metadata is not new. When we search the bibliographic records in a card catalog or in an online public access catalog, we are searching metadata records. Each record or card consists of data describing some other data—like the data in a book or on a CD. Another example would be a manual or electronic address book. Each record in an address book consists of metadata (or statements) about a person or organization.

The difficulty with finding educational objects (or any particular object) on the Web has been the fact that no one has bothered to create concise structured metadata statements about those objects that would make them easier to find by search engines. One of the mandates of the GEM project is to facilitate the creation of such metadata by GEM Consortium members distributed around the world. That means designing tools to both catalog learning objects by generating metadata about them and to gather (or "harvest") that metadata to build an easily searchable database. Much of the R&D work at GEM focuses on making the metadata creation and metadata searching tools more powerful, more efficient, and more effective. I will discuss several of these R&D projects in the following paragraphs.

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Today, in the Web world in which we find ourselves, a useful system for retrieval of geographically distributed educational objects consists of certain fundamental components: (1) repositories of both the digital learning objects themselves and the metadata that describes those objects; (2) registries where information about the nature of metadata statements made about those objects are defined, maintained, and published; and (3) metadata tools necessary for the creation of the statements made about educational objects that will be stored in the metadata repositories and the metadata tools to search across those repositories for objects that meet the needs of the searcher.

Since the metadata record describing an educational object consists of a set of descriptive statements about that object (e.g., author, title, subject, and grade level), success in searching across those records is increased when the descriptive statements made are carefully and consistently constructed. One way to increase the level of search success is to use statement terminology drawn from carefully developed controlled vocabularies, thesauri, and taxonomies. For example, drawing subject terms to assign to a metadata record from well-known thesauri such as the *Thesaurus of ERIC Descriptors, the Art and Architecture Thesaurus or the NASA Thesaurus* or from a controlled vocabulary such as the *Library of Congress Subject Headings* increases the chances that objects that are topically similar will be consistently retrieved.

However, for both the person creating metadata records using terms from such controlled vocabularies and the end users wanting to search for useful educational objects across repositories of those metadata records, having digital access to the vocabularies, thesauri, and taxonomies is critical in order to assign terms to records and to select terms for purposes of searching. To date, there has been no consistent, standardized way for the creators and searchers of metadata to interact with digital repositories of these various forms of controlled vocabularies. One of the R&D goals of GEM is to develop a standard mechanism that will permit metadata creation and searching tools to interact with such repositories. The R&D effort is developing a set of standard communications protocols and schemas that define: (1) the content and sequence of the various messages traveling between the digital metadata creation and search tools and the geographically distributed digital repositories that contain the controlled vocabularies, and (2) the data structures that format the content of the messages for consistent interpretation by digital tools. Such standardized protocols and schemas will make it possible for a tool and a repository to

communicate with each other even if they were unaware of each others' existence prior to the communicative act. As humans, we are able to communicate with total strangers because our speech acts consist of fairly well defined, although somewhat fuzzy, sets of socially acquired communications patterns (protocols) and data structures (languages and syntactic bindings). Unlike humans, machines cannot deal very effectively (if at all) with fuzziness; therefore, the protocols and data structures in machine communication must be very precisely defined, consistently structured, and be well-known among the machines wishing to communicate effectively. The GEM R&D team is developing the protocols and schema for such machine communication and designing a prototype called ThesaurusBrowserTM to demonstrate their utility in the metadata generation and metadata search processes.

Another major line of GEM R&D consists of designing a second set of protocols and schemas for effective machine communication of academic and process standards. With increasing frequency, teachers in K-12 are being required to design instruction around established national, state or local content standards. As a result, creators of metadata for educational objects want to be able to map those objects to particular content standards. In like fashion, teachers want to be able to find education objects by searching on standards. To accommodate this need, the GEM element set contains an element for making statements about academic standards. However, to date, there is no simple way for the creators of metadata to include such standards in metadata describing objects in a sufficiently consistent manner to support effective searching.

In many ways, developing the protocols and schemas for the effective assignment of content standards to educational objects shares many of the assumptions and characteristics of the problem addressed by ThesausrusBrowser and its underlying protocols and schema. It assumes the existence of geographically distributed digital repositories of content standards accessible over the Web. While a few such repositories exist today, large-scale deployment of creation and search tools assumes that ultimately all significant academic content standards will have a Web presence. Given such a presence, a metadata record for any given educational object may contain one or more statements that "point to" specific content standards by embedding uniform resource identifiers (URI) for those standards in the metadata record. This process would be analogous to assigning a Dewey Decimal Classification number to a metadata record that points to the textual string for that number stored

somewhere out on the Web. Just as the assignment of the Dewey number "612.014" to a resource might point to the textual string "Human physiology—Biophysics" in a repository out on the Web (or that textual string in any number of different languages), assigning the URI "M.S1.2.2" from *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education* [3] might point to a Web accessible repository for the Compendium and the following statement:

- **Discipline:** Mathematics
- **Standard 1:** Uses a variety of strategies in the problem-solving process
  - **Grade Level:** 3-5
  - **Benchmark 2:** Represents problem situations in a variety of forms (e.g., translates from a diagram to a number or symbolic expression) [4]

Just as with the Dewey Decimal number, the "intelligence" for the example standard from the *Compendium* rests in the number and not in the specific textual strings that the URI references. Thus, like the Dewey number, the standard URI can reference the same content in any language into which it has been translated.

Given such Web-accessible repositories of content standards, one of the R&D problems is developing the appropriate protocols to support communication between metadata generation and search tools and those repositories. In other words, given a communication "session" between a generation/search tool and a repository, what is the sequence and purpose of individual communicative acts. The second R&D problem is to develop well defined means of encoding the content of those acts for purposes of machine reading and processing. In other words, how can we take a set of statements like the example standard from the McREL *Compendium* and encode them in a standard way for transmission from the repository to the generation and search tools. The GEM R&D team is developing the protocols and schema for such machine communication and designing a prototype called StandardConnectionsTM to demonstrate their utility in the metadata generation and metadata search processes.

Just as there is a team of managers, information specialists and technology experts at ERIC/IT in Syracuse handling the daily operations of the GEM initiative and the metadata repository and its supporting systems, so there is an R&D team of information scientists and systems developers in The Information School of the University of Washington addressing the next generation of the GEM system. GEM's future is dependent on a careful balance among GEM as a production system, GEM as a standards body,

and GEM as a research environment. If we can characterize "research" as the process of managed change, we can characterize "standards" as managed stasis—a state that allows for the standard diffusion of the innovations borne of the processes of research. If GEM as an information system is to serve its constituencies well, it must carefully balance these notions of change and stasis as GEM evolves as a real world system serving the nations teachers and learners.

Notes & References

1. The Gateway to Educational Materials (GEM)
2. For examples of a variety of content standards, see Putnam Valley; see also, McREL Compendium.
3. John S. Kendall and Robert J. Marzano. *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, 3rd Edition. Aurora, CO: McREL, 2000.
4. A URI for the English statement of this standard might look like the following: "http://www.mcrel.org/compendium/ed3/english/mathematics#S1.2.2"

Biographical Information

Stuart A. Sutton is associate professor in The Information School of the University of Washington where he teaches and does research in the areas of organization of information and metadata systems and the law and policy of information and information practice. Dr. Sutton also serves as a Senior Research Scientist with the Information Institute of Syracuse and leads the GEM research and development efforts. He also serves as co-chair (along with Jon Mason from Education Network Australia (EdNA)) of the Dublin Core Metadata Initiative Education Working Group that is defining metadata standards for describing educational objects on the Web. He holds masters degrees in theatre arts, library and information studies, and in intellectual property and a J.D. from Golden Gate University. He is a member of the California Bar. Dr. Sutton earned his Ph.D. in Library and Information Studies from the University of California at Berkeley in 1991.

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Information Professionals Chart Future of Internet Q&A

by Joann Wasik

Some of the foremost experts in digital reference offered insights into the future of Internet-based question-and-answer services at the Virtual Reference Desk's "Facets of Digital Reference" conference held October 16-17, 2000 in Seattle, WA.

The conference attracted over 500 information professionals from libraries, government agencies, higher education, business, and other industries. Participants from Australia, Hong Kong, Sweden, Denmark, Canada, and Japan, as well as the U.S., attended the event.

"It was an incredible conference," said R. David Lankes, director of the ERIC Clearinghouse on Information & Technology and founder of the Virtual Reference Desk project. "I was struck by the eagerness of the audience and excitement around digital reference."

The two-day conference featured seven concurrent track sessions, offering a variety of interactive panel discussions and presentations addressing key issues in digital reference. Over 40 presentations and 60 speakers were featured at the conference, the largest of its kind. Topics included software and synchronous technologies for real-time reference transactions, management and staffing issues, electronic resources, user needs in digital exchanges, legal liability, and emerging back-end applications for creating new services.

Several issues emerged from the conference as this year's "hot topics" in digital reference. The problem of scalability, or the ability of services to grow exponentially in response to user demands, was discussed in several presentations. Quality criteria for expert responses and evaluation methods were frequently noted, as was the proliferation of new

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commercial services and increased competition for libraries. Sessions devoted to new software technologies and tools to help automate and streamline Internet-based information exchanges were extremely popular with conference goers, and often resulted in standing room-only crowds. Web contact software, such as that demonstrated by Library Systems and Services' (LSSI) Steve Coffman, has been developed specifically for real-time reference transactions in libraries. Another real-time product, called LivePerson, was presented by Paul Constantine of Cornell University. LivePerson is an e-commerce software package that has been adapted for use in Cornell University Library's LiveHelp service. Additionally, Blythe Bennett, Learning Center Coordinator at the Virtual Reference Desk, demonstrated VRD's Incubator software. The Incubator is designed to help digital reference practitioners efficiently accept, route, and answer Web-based questions, displaying easy-to-use interfaces for both front-end (public) and back-end (administrator) views.

Each day of the conference began with an opening plenary session and focused on an issue of particular interest to today's digital reference provider. On Monday, October 16, David Lankes presented an overview of current initiatives in Internet-based Q&A, including collaborative efforts, service management models, and technology standards. The keynote speakers were Michael Eisenberg, director of the Information School at the University of Washington, and Charles McClure, Francis Eppes Professor at Florida State University's School of Information Studies. Eisenberg and McClure, renowned lecturers and authors on information problem solving and reference evaluation respectively, presented "Digital Reference Librarians: Who Needs 'Em?" In this lively session, Eisenberg and McClure discussed whether librarians are fighting a losing game in the increasingly competitive knowledge marketplace, or whether the new millennium offers exciting new possibilities for the profession.

The plenary session on Tuesday, May 17 featured a panel of digital reference experts that included representatives from Ask Jeeves, the National Agricultural Library, Library of Congress, the University of Washington, Multnomah County Library, and AskMe.com. Moderated by Lankes, the panel discussed privacy issues, collaborative reference efforts, fee-based services, and other issues that impact digital reference provision. The panel also explored whether human intermediation is vital for effective information retrieval, and the current problems of scalability as question volumes to electronic reference services continue to grow.

Speakers at this year's conference came from a variety of organizations, including public and academic libraries, government agencies, subject-specific digital reference services, and the commercial sector. Speakers included Penny Finnie, Vice President of Ideas at Ask Jeeves; Diane Kresh from Library of Congress; Pauline Lynch Shostack, coordinator of AskERIC; Joseph Janes and Stuart Sutton, assistant and associate professors at the University of Washington; Blane Ampthor of the Central Intelligence Agency; Michael McClennan from the Internet Public Library; Laura Brendon of Eisenhower National Clearinghouse; and Joan Stahl from the National Museum of American Art.

An awards ceremony and reception was held Monday evening to recognize excellence in the practice and research of Internet-based information provision. Recipients of the VRD 2000 Exemplary Digital Reference Service Awards were the Internet Public Library, sponsored by the School of Information at the University of Michigan; Ask a Hurricane Hunter, a service of the 53rd Weather Reconnaissance Squadron, U.S. Air Force Reserve; and Ask Us! Online, a service of the Multnomah County Library (Oregon). Steve Coffman, Product Development Manager at Library Systems and Services, Inc. (LSSI) and frequent author on digital reference issues, was awarded this year's Director's Award. Silvia Barcellos, a Ph.D. student in the School of Information Studies at Syracuse University, received the Best Student Paper Award for her paper "Understanding Intermediation in a Digital Environment: An Exploratory Case Study."

In its two-year history, the VRD Digital Reference Conference has emerged as the premier conference for electronic expert information and reference services. The next VRD conference is slated to be held in fall 2001 in Orlando, FL.

The Virtual Reference Desk is a project of the U.S. Department of Education, and is operated by the ERIC Clearinghouse on Information & Technology at Syracuse University.

Joann M. Wasik is a consultant and communications officer for The Virtual Reference Desk project.

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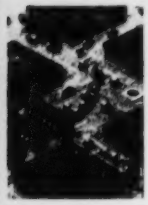

A Study of Digital Reference in a Federal Agency

by Joanne Silverstein

Digital reference may be known by several names including electronic question and answering, online reference, and e-mail-based reference. Until recently, digital reference was considered to be a novel way for organizations to provide information. Now, digital reference is ubiquitous and is conducted at libraries, schools, universities and many other organizations. Digital reference affects, and is affected by, the organizations in which it is conducted.

Recognizing the importance of such knowledge, the United States Department of Education recently commissioned a large-scale study of its own digital reference services. At the Department of Education, digital reference is conducted in centers where information specialists use e-mail to provide answers to consumers' questions. Information specialists at the Department of Education consider themselves part of an inter-office Web and email-based reference service, and refer to themselves collectively as "ED.gov."

Because accessibility to computers and the Internet is increasing, the number of consumers sending e-mail questions to ED.gov is growing. The centers received over one million digital reference questions in 1999 and the number is burgeoning. ED.gov information specialists are dedicated to customer service, but the increased demand for information strains departmental resources and can pose. difficulties.

The United States Department of Education was an early and innovative advocate of e-mail and Web-based information service. In the early 1990's - long before most federal agencies were online - the Department of Education encouraged each of its offices to craft its own infrastructure,

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and to develop procedures and policies for answering consumers' questions. For a long time, this approach served the individual centers well. Sharing information became difficult however as other offices and new users wanted to access information. The use of different information formats made it difficult to standardize processes, and to track and archive questions across ED.gov centers.

In 1999, the Department of Education contracted with the Virtual Reference Desk at the ERIC Clearinghouse on Information & Technology at Syracuse University to conduct a major research initiative. The intention of the research was to reveal issues about, and find recommendations for, optimal provision of information. The study featured methodical data gathering, and began with an assessment of the current processes, procedures and challenges in ED.gov centers. Outcomes included suggestions for improving information delivery to customers, recommendations for policy implementation, software requirements for possible future automation of processes, and suggestions for training managers and specialists.

The findings may be applicable to digital reference services in many organizations.

Key Findings

ED.gov specialists reported that they encountered challenges with almost every aspect of answering and tracking consumers' questions. They found it was becoming increasingly difficult to:

- check quality and content of referred answers
- formalize and share reference lists (of other specialists and their areas of expertise)
- share and use Frequently Asked Question (FAQ) files and archives
- keep FAQs accurate, up-to-date and consistent across related resources
- differentiate among types of questions and answers
- understand standards and procedures for tracking, archiving and referring questions
- educate consumers of varying expertise levels
- identify consumer populations, and priorities for their levels of

service.

Certain philosophical differences created divergent policies and practices and were particularly troublesome in the centers' quickly changing environments. Specialists often disagreed with each other, and with managers, about the identity of their primary customers and about how to best answer their questions. One specialist, for example, could think that a United States senator's question must be answered first. Another specialist could believe that the general public should be served first.

Philosophical differences over the identity of the primary customer were exacerbated by the fact that new users came not only from the centers' traditional user population, but from new populations as well. New users had varying levels of skill and some asked high-context questions and required rich synthesis in their answers. Others had little knowledge about how to phrase queries or conduct searches.

New customers also asked new kinds of questions and some could have been sent to inappropriate offices for answers. Specialists had to identify questions that were within the scope of their offices (in-scope questions) vs. questions that were outside the scope of their offices (out-of-scope questions). Once a specialist determined that a question was in-scope, he or she had to choose the most appropriate format out of many for an answer.

A growing number of online information resources overwhelmed specialists with more information, new interfaces, more learning curves, and greater expectations for service. These forces combined to create both internal and external challenges to the centers' management of answers.

Internal Challenges in Managing Answers

The term tracking refers to the monitoring of a question's progress as it is sent to other information providers. It is an important activity in customer service. Tracking at the ED.gov centers, however, lacked consistency across centers, and varied according to time, tools and media types. Commitment to overcoming these challenges also varied across centers and according to the abilities of the specialists who worked with the

systems.

Archiving refers to the storage of answers for possible reuse, and presented some of the same challenges as tracking. Like tracking, archiving is a fragmented process that differed from center to center. Archiving was constrained by lack of standards and insufficient support.

FAQs are educational tools that were developed from archived answers to frequently asked questions. FAQs were difficult to find, and therefore were underused. This resulted in wasted resources and a continual re-creation of answers.

In addition, the procedures for tracking, archiving and creating FAQs were developed in separate offices, each of which selected its own database platform, processes, operating system and applications. These "islands" of development created disconnects when centers attempted to share information internally.

External Challenges in Managing Answers

The centers faced two kinds of challenges that came from outside the organization. First, current events in the news triggered increased demand for information. Because of their dynamic nature, questions about current events allowed little time for coordination of timely, consistent and accurate department-wide answers.

Secondly, journalism influenced the centers in two ways - formally and informally. Formally, professional journalists often wrote about a Department of Education office and disseminated the center e-mail address in newspapers and other media without first contacting the center. Consumers, having read the articles in their local newspapers, went to their computers in great numbers to access the service. The "traffic" of questions then spiked, straining workloads and answer quality.

Informally, non-professional "journalists" (parents, students, teachers and researchers) cut, pasted and electronically disseminated previously published articles into school newsletters, personal home pages and consumer guides. Again, spikes in traffic resulted.

Nevertheless, it is important to note that growing consumer interest generated by formal or informal dissemination of United States Department of Education information must be served and encouraged. To do that, ED.gov specialists and managers must acquire new skills to address emerging issues in digital reference.

Issues

In summary, the findings of this study can be grouped into six issues:

1. Coordination of standards, documents and procedures.
2. Consistency of policies from center to center.
3. Standardization across centers.
4. Development of software.
5. Training for center specialists and managers.
6. Resource sharing.

Solutions to these challenges cannot be accomplished easily or quickly. But the following recommendations may help ED.gov, (or any large organization practicing digital reference) address the issues.

Recommendations

The Department of Education already recognizes the importance of re-thinking digital reference, and the recommendations made here are intended to provide specific, actionable actions that will support the goal of improved services. While each recommendation below may not be appropriate for all other organizations, some may be useful to other government agencies or large organizations. The recommendations are predicated on the assumption that each digital reference service must consider a broader view of its own services than it may be used to, Recommendations include:

1. Choose a champion. The momentum needed to induce large-scale change must be spearheaded by a person or group that is both influential and well resourced. In the case of ED.gov a group of specialists self-organized, procured a budget and made digital reference optimization a mission. In other organizations, the

champion could be a highly placed executive. Whether a group or an individual, the champion's duties are to procure resources and determine the optimal level of centralization.

2. Determine level of centralization. Should one centralized authority require all centers to use the same tools and policies? Route their questions in the same way? Format their answers similarly? If not, how much standardization will there be across centers? Answers to these questions should be secured.

3. Incorporate AskA software into a Department-wide intranet. Once high level issues such as policy, format and procedures have been decided upon, they can be implemented using software. Some digital reference services use existing software and build on customized functionality. Others use software designed specifically for AskA services, such as the Incubator created by the Virtual Reference Desk Project at the ERIC Clearinghouse on Information & Technology.

4. Employ QuIP protocols to enable resource sharing across Centers. QuIP is the Question Interchange Protocol (created by R. David Lankes, the director of the ERIC Clearinghouse on Information & Technology), and is designed to facilitate the exchange of questions and answers among organizations. It could be used at ED.gov to automate processes and provide faster and more accurate answers. More information about QuIP is available at http://www.vrd.org/Tech/QuIP/1.01/1.01d.htm.

5. Use checklists to translate policy into actionable items.

6. Formalize the Frontline Forum (an ED communications group) and use it to coordinate software specification and standardize operations across centers.

7. Coordinate a "fast-response" team to provide fast and accurate answers to questions about current events, thus preventing traffic spikes in the centers.

8. Research commercially available software packages to determine if they support center processes and procedures.

9. Create training goals and plans, and decide on implementation mode(s).

10. Evaluate daily operations using checklists.

11. Continuously gather and use feedback to upgrade systems and services.

These recommendations address specific challenges at ED.gov, but may also serve to inform and support digital reference practice at other organizations that face increasing expectations for digital reference service.

Joanne Silverstein is head of research for the Information Institute of Syracuse at Syracuse University.

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ERIC Announcements

- Leading Providers of Online Educational Resources in the United States and Australia Announce Cooperative Agreement
- The Virtual Reference Desk Announces: Setting Standards and Making it Real—The VRD 2001 Annual Digital Reference Conference

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ERIC Announcements

Leading Providers of Online Educational Resources in the United States and Australia Announce Cooperative Agreement

The Gateway to Educational Materials (GEM) Project (www.geminfo.org) and education.au limited, managers of the Education Network Australia (EdNA Online), have made a cooperative agreement to share quality online educational resources between the two countries and to improve methods of organizing and cataloging these resources.

The agreement enables researchers from GEM and EdNA to collaborate on efforts designed to further the development of online educational resources, in particular projects that relate to metadata and taxonomy services. Sharing of GEM and EdNA metadata will also enable interoperability testing between the two projects.

The agreement is part of both GEM and EdNA's ongoing, wide-ranging efforts to ensure that educators have access to the substantial collections of educational materials that are available on various federal, state, university, nonprofit and commercial Internet sites.

"The partnership between EdNA and GEM is essential for creating a seamless network of education information," says R. David Lankes, director of the ERIC Clearinghouse on Information & Technology, which houses the GEM Project. "We view this relationship as essential, reaching across the world to improve teaching and learning," Lankes says. "The entire GEM team is thrilled."

Gerry White, CEO of education.au limited, says that "the close working relationship developed between GEM and EdNA heralds a new era of global cooperation in education. This will benefit all those who access digital resources—including teachers, students, lecturers and parents—by significantly expanding the number

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of quality educational resources available through our Web sites."

EdNA Online, Australia's national education and training gateway, is managed by education.au limited on behalf of all Australian governments and the Australian education and training community. It provides access to 325,000 indexed items derived from 11,000 evaluated educational resources.

GEM is recognized as a national leader in the United States in providing educators with access to thousands of online resources through its Web site (www.thegateway.org). The Gateway to Educational Materials has more than 15,000 educational resources catalogued on the Web site. GEM, which is funded by the U.S. Department of Education, is a special project of the ERIC Clearinghouse on Information and Technology at Syracuse University.

Education officials in both the United States and Australia have indicated a willingness to make available comprehensive listings of quality education and training resources, and have cooperated with the GEM Projects' initiatives.

For further information, contact Marilyn Tickner at: geminfo@geminfo.org

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ERIC Announcements

The Virtual Reference Desk Announces: Setting Standards and Making it Real—The VRD 2001 Annual Digital Reference Conference

November 12-13, 2001
The Rosen Plaza Hotel
9700 International Drive
Orlando, FL

Hosted by:

- Information Institute of Syracuse
- Syracuse University's School of Information Studies
- Information Institute at the School of Information Studies, Florida State University
- SOLINET

CONFERENCE THEME

Digital reference is now a reality in many libraries and organizations around the world. The Internet is fast becoming a common tool for reference service, allowing information professionals to interact with users in environments unbound by time, place, and other communication barriers. How can we ensure that such service is carried out most effectively and efficiently? What standards exist for service quality and technology? You are invited to participate in these and other important discussions as we continue to define the evolving field of digital reference.

Proposals are now being accepted for breakout session presentations and poster sessions. Please refer to the Call for Proposals for details.

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Conference topics include:

- **Technology for Digital Reference** - Real-time/live reference, software solutions.
- **Digital Reference Service Management** - Service development, policy, evaluation, staffing, marketing.
- **General Issues in Digital Reference** - Partnerships, legal and ethical issues, current research, case studies.
- **Digital Reference Resources** - Search tools and services, online resources, assessment methods
- **Standards for Digital Reference** - Quality criteria, technology standards, interoperability

The conference calendar currently includes:

- **November 11:** Preconference Workshop: Developing Quality Standards for Digital Reference Service

- **November 12-13:** VRD 2001 Annual Digital Reference Conference: Setting Standards and Making it Real

Who should attend?

- Librarians and other information professionals
- Digital reference and AskA service representatives
- Government agency representatives
- Commercial sector representatives

Conference sponsors to date include:

- The U.S. Department of Education
- The National Library of Education's ERIC Clearinghouse on Information & Technology
- The Library of Congress
- ALA RUSA
- Syracuse University's School of Information Studies

Local Information:

Orlando is home to many attractions including Walt Disney World, Universal Studios, and SeaWorld. The area also offers many shopping and dining options and evening entertainment. See the Go2orlando Web site for more information on local attractions and events.

The Rosen Plaza hotel is located on International Drive, just one mile from Sea World, five minutes to Universal Orlando, and 10 minutes from Walt Disney World Resort. Point Orlando - a shopping, dining and entertainment complex - is located across the street from the hotel.

For more information about this conference:

Contact: **Marilyn Schick**
Virtual Reference DeskSM Project
Phone: 800-464-9107
E-mail: vrdconf@vrd.org

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ERIC Publications

Instructors: Are you looking for new textbooks for your next Instructional Technology course? Consider these new ERIC Clearinghouse on Information & Technology publications.

- **NEW! Instructional Design Competencies: The Standards**. Third Edition. by Rita C. Richey, Dennis C. Fields, and Marguerite Foxon with Robert C. Roberts, Timothy Spannaus, and J. Michael Spector.

  In 1986, the International Board of Standards for Training, Performance and Instruction (IBSTPI) published the first edition of Instructional Design Competencies: The Standards. It was the culmination of work that began in 1978. In retrospect, that work occurred in the infancy (or at least the toddler years) of the practice of instructional design (ID). In this volume IBSTPI presents its latest view of the competencies of instructional designers. It is a greatly expanded view that reflects the complexities of current practice and technology, theoretical advancements, and the social tenor of the times. Nonetheless, it is a view that is still rooted in the traditional notion of instructional design competence. 220 pp. (approx.) 6" x 9"; $20.00; IR-111. (ISBN: 0-937597-52-X)

  Order now from: ERIC Clearinghouse on Information & Technology. Syracuse University. Call 1-800-464-9107 or e-mail amy@ericir.syr.edu.

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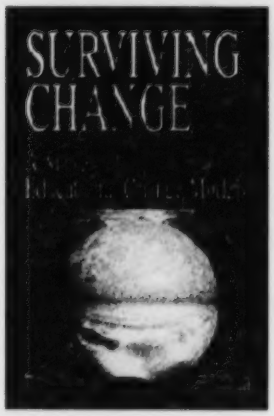
- The Legacy of Robert M. Gagne by Rita C. Richey

The Legacy of Robert M. Gagne is a three-part text.

The first five chapters, written by Gagne, present Gagne's theories of human development, instruction, and learning. The next four chapters, written by Gagne's colleagues, reflect on the pervasiveness of Gagne's ideas, and the final chapter considers the future role of Robert M. Gagne's influence in instructional design. Visit the table of contents and excerpt. VISA and MasterCard accepted.

- Surviving Change: A Survey of Educational Change Models by James B. Ellsworth



Ellsworth fashions a theoretical roadmap for managing change based upon the change literature. This text makes several "assumptions" about approaching change: (1) that change can be understood and managed, (2) that there are several helpful models for managing change, and (3) that lasting change considers the needs and priorities of many stakeholder groups. Visit the table of contents and excerpt. VISA and MasterCard accepted.

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ERIC Digests 2000/01

ERIC Digests are short, topic-related reports with reading lists included. Digests are written and reviewed by professional content experts in library science and educational technology disciplines. Read the ERIC abstract, then link to the full text of each Digest below:

- NEW! The Role of the School Library Media Specialist in the 21st Century by Carrie A. Lowe. November 2000. (ERIC IR057896) (EDO-IR-2000-08)

  This digest discusses the role of the library media specialist. The first section notes the lessons and legacy of "Information Power," the American Library Association's standards for school library media specialists. Technology and opportunity for library media specialists are discussed in the second section, and the third section considers challenges for library media specialists. The fourth section summarizes the following guiding principles: (1) school libraries have no boundaries; (2) library and information professionals should be flexible; (3) ensure that students are effective users of ideas and information; and (4) information is everywhere, essential, and central. Change and the library media specialist is the topic of the fifth section, and the sixth section describes the information and technology team. The final section discusses a few steps for library media specialists to consider in creating a promising future, i.e., learn and absorb, get involved, and be a leader. (Contains 15 references.)

- NEW! Internet Resources for Library Media Specialists and Children's Librarians by Blythe A. Bennett. November 2000. (ERIC IR057958) (EDO-IR-2000-09)

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This ERIC digest is an annotated listing of 50 Internet resources for library media specialists and children's librarians. The resources are organized under the following headings: AskA services; electronic discussion groups; evaluation; Internet basics; keeping current; information literacy; lesson plans; online journals and book reviews; policy; professional organization World Wide Web sites; professional resource links; research; and technology.

- The Field of Educational Technology: Update 2000. A Dozen Frequently Asked Questions by Donald P. Ely, March, 2000. (ERIC IR019983), (EDO-IR-2000-01).

The purpose of this digest is to provide background information and sources that help to understand the concept of educational technology and to serve as a pathfinder to relevant and timely publications that view the field from a variety of perspectives. The following frequently asked questions are addressed: (1) What is educational technology? (2) What are the roots of educational technology? (3) What is a good source of research findings? (4) What do educational technologists do? (5) Where are educational technologists employed? (6) Where do educational technologists obtain professional education? (7) What fields offer good preparation for educational technology? (8) What are the major professional organizations? (9) What publications do educational technologists read? (10) What are the comprehensive references for the field? (11) What textbooks are commonly used? and (12) Where can more specific information about educational technology be found? (MES)

- An Introduction to Internet Resources for K-12 Educators: Part I. Information Resources, Update 2000 by Nancy Morgan, Updated by Carolyn Sprague, March 2000. (ERIC IR020281), (EDO-IR-2000-02).

The Internet is an international computer network composed of thousands of smaller networks. As K-12 schools connect to the Internet, a new method of communication opens up to educators and their students. This ERIC Digest describes some sample services and resources that are available to the K-12 community by electronic mail over the Internet. Question answering services, electronic discussion groups, and Usenet newsgroups are highlighted. A list of references and readings is also included. (Resources and addresses are subject to change.) (AEF)

- An Introduction to Internet Resources for K-12 Educators: Part II. Question Answering, Electronic Discussion Groups, Newsgroups, Update 2000 by Nancy Morgan, Updated by Carolyn Sprague, March 2000. (ERIC IR020281), (EDO-IR-2000-03).

  The Internet is an international computer network composed of thousands of smaller networks. As K-12 schools connect to the Internet, a new method of communication opens up to educators and their students. This ERIC Digest describes some sample services and resources that are available to the K-12 community by electronic mail over the Internet. Question answering services, electronic discussion groups, and Usenet newsgroups are highlighted. A list of references and readings is also included. (Resources and addresses are subject to change.) (AEF)

- Internet Resources for K-8 Students: Update 2000 by Blythe Bennett, April 2000. (ERIC IR020288), (EDO-IR-2000-04).

  Although there are many content-rich resource sites for elementary and middle school students on the World Wide Web, finding such sites can often be difficult. This ERIC Digest describes more than 50 K-8 curriculum related Web sites of special interest to students, teachers, parents and librarians. Sites are listed under the following categories Collections of Sites; Art; Current Events; Health; History/Social Studies; Literature; Reference Materials Online; Science Related Sources; Search Directories for Kids; Electronic Postings for New Sites for Kids; and Books with Web Sites for Kids. (Resources and their Internet addresses are subject to change.) (AEF)

- Laptop Computers in the K-12 Classroom by Yvonne Belanger, May 2000. (ERIC IR020320), (EDO-IR-2000-05).

  Improvements in portable computing technology and examples of successful pilot programs using laptop computers and other portables have inspired many K-12 schools to consider laptops for their students. In a study of Anytime Anywhere Learning, commissioned by Microsoft (published as the Rockman Report), five models were identified of laptop use currently in place at the K-12 level: Concentrated, where each student has his/her own laptop for use at home or in school; Class set,

where a school-purchased classroom set is shared among teachers; Dispersed, where in any given classroom there are students with and without laptops; Desktop, where each classroom is permanently assigned a few laptops for students to share; and Mixed, which is some combination of these models. While the future of mobile computing in K-12 education is still uncertain, and though solutions of cost, technical support needs, security, and equitable access remain challenges for many schools, many with laptop programs remain positive and enthusiastic about the changes observed and benefits their students derive from access to portable computers. Although many laptop programs are new and studies are still in progress, research has shown educational benefits from the use of laptops, particularly with respect to increasing student motivation and creating more student-centered classrooms. (AEF)

- Teachers and Librarians: Collaborative Relationships by Shayne Russell, August 2000. (ERIC IR # IR057903), (EDO-IR-2000-06).

  Although library literature reflects more than two decades of interest in collaborative planning between library media specialists and teachers, and though library media specialists are well-trained to perform in this capacity, there are still fewer examples of instructional partnerships than may be expected. However, commitment to the goal remains strong. This ERIC Digest focuses on the research literature addressing these collaborative relationships, noting the results of a study by the Library Service Center of the Colorado State Library which offer the most recent support for library media specialists and teachers working collaboratively, as well as a significant number of prior studies that indicate a positive relationship between the library media program and academic achievement. Following a definition of collaboration, the roles of each partner, and the benefits, conditions favorable to collaborative partnerships are outlined in terms of administrative and interpersonal factors. Contains 25 references. (AEF)

- A Survey of Educational Change Models by James B. Ellsworth, September, 2000. (ERIC IR# IR020264), (EDO-IR-2000-07).

  We must strive to guide all our change efforts with a systemic understanding of the context in which they are undertaken. Depending on the circumstance, or as the implementation effort progresses, it may be

most effective to focus interventions on a particular component of the framework at a time. This ERIC Digest presents a sequence for approaching the major perspectives, or "models," of educational change in the research. Anyone trying to improve schools may look to "The New Meaning of Educational Change" (Fullan and Stiegelbauer, 1991), to decide where to start. From there, "Systemic Change in Education" (Reigeluth and Garfinkle, 1994) can be read to consider the system being changed. Once the change process has begun, "The Change Agent's Guide" (Havelock and Zlotolow, 1995) can be read for discussion of how to guide and plan future efforts. The Concerns-Based Adoption Model (Hall and Hord, 1987) provides tools to "keep a finger on the pulse" of change and to collect the information needed. "Strategies for Planned Change" (Zaltman and Duncan, 1977) can help narrow down the cause(s) of resistance to change efforts. "Diffusion of Innovations" (Rogers, 1995) identifies the most influential attributes of an innovation, and the "Conditions for Change" (Ely, 1990) can help address obstacles that arise from the environment in which change is implemented. Contains 10 references. (AEF)

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ERIC Database 2001

The ERIC Clearinghouse on Information and Technology reviews the literature in library and information science and educational technology. ERIC/IT contributes more than 1000 documents and 2000 journal articles related to library/information science and educational technology to the ERIC Database every year. The abstracts below represent a sampling of ERIC database articles that relate to topics in this issue of the ERIC/IT Update.

- **Systems of Knowledge Organization for Digital Libraries: Beyond Traditional Authority Files**

Hodge, Gail. 2000, 46 pp., (ED440657), Paper Copy: $9.36, Microfiche: $1.59; Domestic Fax: $25.46; International Fax: $124.36; Electronic (PDF): Free. This report provides an overview of knowledge organization systems (KOSs) and includes pertinent examples of their application to digital materials, offering extensive practical information for institutions embarking on digital library initiatives. The first section of the report defines the general characteristics of KOSs, with emphasis on their connection to a particular view of the world. The historic origins and uses of KOSs, in libraries and in other information management environments, are described, and various types of KOSs are discussed. The second section provides examples of how KOSs can be used to enhance digital libraries in a variety of disciplines, and describes how a KOS can be used to link a digital resource to related material. The third section discusses how KOSs can be used to provide disparate communities with access to digital library resources by using a KOS to provide alternate subject access, to add a new mode of access to the digital library, to provide multilingual access, or to support free-text searching. The report concludes with a discussion of issues to consider when using KOSs with digital libraries. It provides a framework for the design, planning, implementation, and maintenance of KOSs in digital

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libraries.

- **Digital Reference Services and Centers at the United States Department of Education: Analysis and Recommendations**

  Silverstein, Joanne; Lankes, R. David. 1999, 94pp., (ED444600), Paper Copy: $18.72, Microfiche: $1.59. This document reports on the e-mail-based question and answer services (digital reference) that the Department of Education offers to customers. The report is presented in five sections. Section 1, "Introduction," outlines the research goals which were to: analyze current processes, procedures and problems; suggest solutions for optimization of information delivery to customers; provide recommendations for policy; outline software requirements for possible future automation of processes; and suggest training goals for managers and specialists. Section 2, "Methods," describes the three-part approach to the research method: document analysis; in-depth interviews at six digital reference sites; and a poll of digital reference administrators representing ED.gov and related Centers. Section 3, "Results," describes findings from each of the above three data sources, and Section 4, "Issues," consolidates the findings and groups them. Section 5, "Recommendations," contains the research team's recommendations for re-designing and improving ED.gov digital reference Centers. Several appendices provide copies of the instruments and a glossary.

- **The Power of Digital Learning: Integrating Digital Content. The CEO Forum School Technology and Readiness Report, Year Three**

  2000, 34pp., (IR020402). ABSTRACT: This report offers a vision for digital learning and focuses on actions that schools, teachers, students, and parents must take to integrate digital content into the curriculum to create the learning environments that develop 21st century skills. Section I presents a vision for digital learning. The power of digital learning is discussed in Section II, including the need for digital learning, the power and potential of digital learning, reasons why digital content is essential to digital learning, digital learning environments, digital learning develops 21st century skills, shifting to digital learning environments, models from the business community, readjustment (expanding the scope of technology integration), the critical importance of professional development, and integrating digital content. The following steps to integrate digital content effectively are presented in Section III: (1) identify educational goals and link digital content

to those objectives; (2) select the student outcomes and performance standards that will be achieved by digital content; and (3) measure and evaluate outcomes against standards and adjust accordingly. This section also includes two recommendations regarding digital content: perform a digital content inventory and increase investment in digital content. Section IV presents a tool for self-assessment. Appendices include Year 3 statistics, "A Call for Equity," resources to help integrate digital content, ISTE (International Society for Technology in Education) and SCANS (Secretary of Labor's Commission on Achieving Necessary Skills) skills and standards.

- **The Cybrarian's Manual 2**

Ensor, Pat, Ed. 2000, 313pp., (ED438823), ISBN-0-8389-0777-6, American Library Association, 155 North Wacker Dr., Chicago, IL 60606-1719 ($45). Tel: 800-545-2433 (Toll Free); Fax: 312-836-9958; Web site: http://www.ala.org/editions. This book examines technical, social, and management issues related to librarians and cyberspace. The following chapters and articles are included: (1) "The Cybrarian's Tool Kit," including "Internet News and Website Reviews" (M. Sylvia), "Searching the Future" (J. Powell), "Netiquette, Hoaxes, and Scams! Oh My!" (E. Dupuis), and "The New Library Demands a Closer Look at Ergonomics" (C. Schofield-Bodt); (2) "A Network of Networks of Networks--Technical Underpinnings," including "The Basics of LAN Technology" (C. Higgins), "The Basics of Nationwide Network for the Internet" (A. deChambeau), and "Internet2 and the Next Generation Internet Initiative" (S. Hardin); (3) "Nothing Is Certain but the Web and Taxes," including "Guidelines for an Excellent Website" (J. Sears & A. Wohrley), "Web-Based Markup Languages" (M. Kalfatovic), "Browser Plug-Ins" (M. Benzing), "A Day in the Life.Multimedia and Librarians in the Twenty-First Century" (B. Eden); (4) "The Document as Object and Commodity," including "Metadata 101" (P. Caplan), "Unique Identifiers on the Web for Documents, Sites, and Domain Names" (C. Riggs), "Copyright in Cyberspace" (G. Hoffmann), and "Cyber-Citing" (K. Vogel); (5) "Puttin' It Out over the Net: Sources and Services," including "Collecting Electronic Resources" (K. Parker), "Let's Put It All on the Web: Practical Information for Digital Imaging" (A. Hough), "Digital Libraries" (P. Jones), "In Search of the Elusive E-Journal" (M. Geller), "Developing an Internet-Based Reference Service" (B. Bennett), and "Electronic Reserves" (J. Rosedale); (6) "The Library'd Be Fine if It Wasn't for All Those People!," including "Providing Web Access in Libraries" (A. Abramson), "Kids, the Internet, and All Those Adult Anxieties" (W. Minkel), "The Iron Triangle of Privacy, Filtering, and

Internet Use Policies" (J. Shuler), "Licensed to Teach" (A. Thornton), and "You Gotta Go to School for That? Pac-Man in the Information Arcade" (J. Seay); (7) "Cutting Edge or Bleeding Edge: You Make the Call," including "Security and Authentication Issues" (M. Breeding), "Wireless and Ubiquitous Computing" (S. Cavrak), "Push Technology" (A. Aaron), "Virtual Reality Primer for Cybrarians" (D. Mattison), and "Quitting the Technology of the Month' Club" (R. Olszewski); and (8) "As the Librarian Turns," including "On the Lighter Side: And a Small Child Shall Lead Them" (J. Johnston), "Rupert Giles, Techno-Terror, and Knowledge as the Ultimate Weapon" (G. DeCandido), "Overcoming Image" (J. Houghton & R. Todd), and "Finding Things and Telling Stories" (J. Myers).

- **LC21: A Digital Strategy for the Library of Congress**

2000, 216pp., (IR057908): National Academy Press, 2101 Constitution Ave., NW, Box 285, Washington, DC 20055; Tel: 800-624-6242 (Toll Free); Tel: 202-334-3313; Web site: http://www.nap.edu. The Library of Congress asked the Computer Science and Telecommunications Board (CSTB) of the National Academies to conduct a study to provide strategic advice concerning the information technology path that the Library of Congress should traverse over the coming decade. The Committee on an Information Technology Strategy for the Library of Congress convened by the CSTB focused its efforts on the present and future of information systems and technologies that are intimately tied to the mission of the Library. The committee emphasizes that the heart of what it learned from this study and the heart of the Library's future are in these areas: inventing a new form for acquiring and preserving materials that includes digital information in all its forms, in particular information that is born digital; opening itself to broader and deeper dialogue with the world of information professionals beyond its walls; finding the management vision and will to make paradigmatic change happen in the organization; and investing in the technology infrastructure required to support such change. The Executive Summary provides an outline of the report's conclusions and presents the findings and recommendations. The other sections of the report include: Digital Revolution, Library Evolution; The Library of Congress: From Jefferson to the Twenty-First Century; Building Digital Collections; Preserving a Digital Heritage; Organizing Intellectual Access to Digital Information: From Cataloging to Metadata; The Library of Congress and the World Beyond its Walls; Management Issues; and Information Technology Infrastructure. Following an Afterword and a Bibliography are appendices containing

biographies of committee members, briefers at plenary meetings and site visits, a list of letters received, and a glossary of acronyms.

- **A Meta-Data Driven Approach to Searching for Educational Resources in a Global Context**

Wade, Vincent P.; Doherty, Paul. 2000, 10pp., (IR020514). This paper presents the design of an Internet-enabled search service that supports educational resource discovery within an educational brokerage service. More specifically, it presents the design and implementation of a metadata-driven approach to implementing the distributed search and retrieval of Internet-based educational resources and compares its performance with current search services, e.g., Internet search engines. The paper first presents a business model, identifying the possible different actors (customer, access network provider, broker, educational service provider, value added service provider, and content provider) in the context of a global educational open market. The major components of education metadata as defined by the IEEE (Institute of Electrical & Electronics Engineers) are summarized, including general, lifecycle, meta-metadata, technical, educational, rights management, relation, and annotation components). An architecture that reflects this model is then outlined. In focusing on the role of the educational broker, the current state of the art with respect to a metadata driven approach to educational content description is examined. More specifically, the paper concentrates on the metadata-driven search and retrieval issues when designing, implementing and trailing such a brokerage search manager, including the metadata cache and mapping XML to the relational model. The paper concludes with experiences of operating such services in a pan-European trial as part of the GESTALT research project.

- **The ERIC Database and Its Technical Processes: Entering the 21st Century**

Sutton, Stuart A. 2000, 42pp., (ED437932)), Paper Copy: $9.36, Microfiche: $1.59; Domestic Fax: $24.06; International Fax: $114.36; Electronic (PDF): Free. This paper explores general issues surrounding the Educational Resources Information Center (ERIC) database--its content, operations, and possible "futures." It addresses specific questions regarding restrictions on content and, in particular, the exclusion from the database of a range of non-print media; and the exclusion of the majority of resources and services

developed independently by the ERIC Clearinghouses. A transitioning of the database to a knowledgebase is suggested, through fully integrating the system's disparate and currently unrelated services and resources. The paper examines the need to adopt emerging metadata standards as the mechanism for describing all resources and services system-wide. In addition, it presents one model of a distributed repository system to suggest alternatives to the current centralized modes as a possible means of managing the volatility of Web-based resources. As ERIC incorporates new technologies and capabilities set out in the ERIC Processing and Reference Facility "Statement of Work," it will have the opportunity to put into place more streamlined processes both for the ongoing development of the knowledgebase and for the development of new technologies that will shape its evolution. The commentary in this area is divided into two major parts: the devolution of some of the editorial functions performed by the Facility to the Clearinghouses; and a redefinition of functions, including an ongoing program of technology development, development of repository, registry, and taxonomy services, an ongoing systematic program of technology research and development, and an ongoing, systematic program in education/training. At the end of each section of the paper, a "Summary Proposal for Investigation" is provided.

- **Educational Media and Technology Yearbook, 2000. Volume 25**

Branch, Robert Maribe, Ed.; Fitzgerald, Mary Ann, Ed. 2000, 354pp., (ED439679) ISBN-1-56308-840-1; ISSN-8755-2094, Libraries Unlimited, Inc., P.O. Box 6633, Englewood, CO 80155-6633 ($70). Tel: 800-237-6124 (Toll Free); Fax: 303-220-8843; Web site: http://www.lu.com. The purpose of the 25th anniversary volume of this yearbook is to reflect on past accomplishments and consider the future as it relates to educational technology and media development. This volume continues to provide information to help media and technology professionals practice their craft in a changing, expanding field. It is divided into seven sections. Part 1 focuses on trends and issues and includes articles on doctoral dissertation research in educational technology, development programs for college faculty, network information discovery and retrieval of educational materials, tools for automating instructional design, benefits of information technology, the E-rate resource guide, Internet relay chat, information literacy, radios in the classroom, and building and maintaining digital reference services. Part 2 covers technology centers and institutes for learning, and part 3 focuses on school library media. Part 4 presents a leadership profile of six significant

figures in the profession: Wesley Joseph McJulien, Stanley A. Huffman, Jr., John C. Belland, Robert M. Diamond, Paul Robert Wendt, and Don Carl Smellie. Part 5 includes information on professional organizations and associations in North America, and part 6 describes U.S. graduate programs in instructional technology. Part 7 is a mediagraphy of print and nonprint resources published in 1998 or early 1999.

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By Ruth V. Small and Marilyn P. Arnone

> "The goal of this project is to make a significant contribution toward achieving the goals described in *Information Power* by helping elementary educators design and deliver high quality information literacy instruction to their students."

The ERIC database includes recent literature on information literacy and distance education, the two areas of focus for this issue of Update.

Feature Articles in Next Issue

The next issue of *Update*, which will be published exclusively online in late December at www.ericit.org, will include original articles by the program directors of six of the best educational technology projects in the country. The U.S. Department of Education's Educational Technology Expert Panel designated these projects as "exemplary" or "promising" last year based on the following criteria: (1) quality of the program, (2) educational significance, (3) evidence of effectiveness, and (4) usefulness to others.

In articles written exclusively for ERIC/IT's *Update*, program directors share lessons learned. Authors will include Michael Simkins of the Challenge 2000 Multimedia Project; Mary Ellen Verona of the Maryland Virtual High School CoreModels Project; Shelley Goldman of the Middle School Mathematics through Applications Program (MMAP); Jane Jackson of the Modeling Instruction in High School Physics project; Nancy Songer of the One Sky, Many Voices project, and Fern Tavalin of the WEB Project.

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Confessions of an Online Distance Educator

By
Donald P. Ely, Professor Emeritus
Founding Director, ERIC Clearinghouse on Information & Technology
Syracuse University

For more years than I want to remember, I taught a graduate level course at Syracuse University entitled, Distance Education. At the same time, I developed or helped to develop instructional technology courses to be offered at a distance for several universities and organizations. As a basis for the development and delivery of these courses, I used the time-honored principles of instructional design. The quiet little secret was that I never *taught* a course at a distance.

After retirement (better, "disengagement," since I didn't stop working), I taught the Introduction to Distance Education course in a face-to-face mode at Florida State University. My bluff was called when I was asked to teach the same course at a distance at the same time. I viewed this challenge as an opportunity to learn about the role of an instructor who is separated from students, only connected by computers. It was an opportunity to make comparisons between the two approaches. At that point the uncomfortable question was, "Could I practice what I *teach*?" Immediately after concurrently teaching the course in the two modes at Florida State, I added to my repertoire by teaching a course at a distance for Nova Southeastern University. (An attempt to increase my credibility!) Each university had a different approach to teaching at a distance. Since there is no agreed upon definition or delivery of distance education, let's pause to consider the elements that make up the concept.

What Is Distance Education?

Is it "distance education" or "distance learning"? Maybe "distance teaching" or "distance instruction" would be more accurate (if you are the teacher). Some call it "online learning" or "anywhere, anytime learning." Regardless of what you call it, physical separation of the instructor and learner is one characteristic. Another is the use of communication media to "deliver" instruction and to permit interaction between the learner and the instructor, as well as among learners themselves. The element that holds the course together is a study guide or course plan that serves as a road map for both the instructor and the learner throughout the course. These parts are systematically related to create an environment for distance learning. In total, the course is a carefully designed process leading to assessment of learning and evaluation of the process itself.

Another distinctive element of online distance education is 24/7 access to the course and related materials. Such access is called *asynchronous* since individuals do not have to be in the same place at the same time to receive instruction. Examples of this mode include Internet-based courses that use the World Wide Web as an organizing vehicle. A contrasting approach is *synchronous* teaching and learning where all learners and the instructor are in communication at the same time, even though they may be remote from each other. Examples of such arrangements are television courses originating from one source and received at many locations and teleconferences that permit two-way video interactions. From this standpoint, online learning would be an inappropriate term but distance learning would apply.

Other options might combine asynchronous and synchronous access to an instructor and resources thus creating a *hybrid* distance learning experience. There is no one way to describe the various combinations that can be utilized to create opportunities for learning at a distance. My Nova Southeastern University experience utilized

online asynchronous activities (mostly e-mail), a brief face-to-face meeting of learners and instructor midway through the course, and a synchronous conference call every other week. A study guide serves as a pace-setter for the learners and provides a list of readings from textbooks and World Wide Web sites.

Now I would like to share what I learned from these experiences. Some findings confirm the principles I have been advocating for dynamic distance education; others were surprises that emerged during the interactions.

From the School of "Hard Knocks": Lessons Learned

- *About learners*. Distance learners require certain capabilities and characteristics that face-to-face learners do not always possess: commitment to learning, persistence, time, and technological (computer) skills. The successful ones are also usually mature and responsible. Those who drop out usually lack some of these characteristics.

- *About instructors*. Advance preparation of a study guide and careful selection of resources reduces the ambiguity that sometimes causes communication problems when individuals are located in separate locations. The use of instructional design principles is the best model for distance teaching and learning.

- *About learning*. Many comparative studies have been conducted to determine the difference between face-to-face and distance learning. In almost every study the research shows that there is no significant difference. My experience confirmed this finding. Most instructors have to prove to themselves that the distance course is equal to the face-to-face course.

- *About teaching*. Learners appreciate prompt evaluation and extensive critical comments about their assignments. Feedback is essential, and the sooner the better. The one-to-one relationship between instructor and learner takes time. To accommodate for individual differences among the learners, a limit of twenty persons for each course is about right.

- *About interaction*. Learning at a distance depends on frequent interaction between the instructor and the students and among students themselves. Instructors can stimulate student-student interaction by forming groups to carry out assignments.

- *About delivery systems*. A distance course can be Web-based or Web-enhanced. A Web-based course provides the basic vehicle for presentation of information, assignments, resources, communication options, grade displays and other useful enhancements that serve as a guide for both student and instructor. There are several Web "templates" that include many standard features for both the instructor and the learner. A Web-enhanced course is usually a supplemental resource for face-to-face courses. It takes the place of handouts, for example, and recommends Web and library resources.

  Technology itself is neutral. It can facilitate communication but it does not "teach." It is a delivery system for substantive content and a vehicle for communication. It has no inherent pedagogy. It is a tool that can help or hinder learning. It must be used as a tool for learning.

- *About resources*. Since so much activity is online while learning at a distance, learners tend to use the World Wide Web extensively, often to the exclusion of traditional library materials. Instructors should urge learners to use the library for primary, refereed source material. There is no "outside" review of WWW content.

Entering the World of Distance Education

If this brief article has whetted your appetite for a distance education experience, you will probably begin to plan by selecting a course that you have already taught. That is how most distance courses begin. The approach to planning a traditional course is to determine what you, the teacher, will do. In the realm of learning at a distance, the focus is on the learner. What is it you want the learner to do? The most successful distance learning occurs when instructor and learner are interacting about

substantive issues. I found more one-on-one exchanges in my distance courses that in traditional courses. It can become a tutorial relationship with frequent communication.

Beyond the objectives, you will have to consider the medium or media you will use since this decision will often facilitate or limit your plans. When it comes to selection of a medium, you will have to be sure that each learner has access to that medium and that you have the competencies to use it. The means and frequency of communication is an essential element of the planning as is the assessment of learner progress. Providing criteria for assessment of exercises and assignments is a helpful guide.

The one thing that has helped me to teach at a distance the most is to assume the role of learner--the role of a student who is enrolled in the course. That person is an individual you will probably come to know better than any student in a traditional course. As you plan, think of individuals, rather than of the "class." While you are working on this role, you have one additional responsibility: to learn about distance education as you are practicing it. I know I will be a better teacher, in any context, because of the experience I have had teaching at a distance. It's new. It's exciting. It's hard work. I hope you will gain satisfaction if you participate in this stimulating approach to teaching and learning. You will never be the same!

Selected Sources on Distance Education

Begin your journey by contacting AskERIC:
http://www.askeric.org
Click on "distance education" for a comprehensive list of references.

For an overview of the distance education field:
http://www.uidaho.edu/evo/distglan.html

For daily updates on what is happening in distance education:
http://www.distance-educator.com

For up-to-date information about academic resources in higher education:
http://www.uwex.edu/disted/home.html

For information on WWW templates:
http://blackboard.com
http://WebCT.com

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Teachers and Librarians--Closing the Digital Divide

By
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Chair, National Forum on Information Literacy

The rapid development and expansion of information technology is impacting on the well being of nations and individuals. Huge sums are being expended for network and computer technology in the hope of economic improvement, better education and enhanced quality of life. To date, the results have not paid off for the economically and socially at-risk or for the poorer countries of the world. The very power of the Internet to provide access to a growing tidal wave of information places an immense barrier to people who cannot benefit from its use. Indeed, one of the outcomes of our increasingly high-tech world is a growing digital divide between the information "haves" and "have-nots."

The challenge of offering the benefits of today's information society to the "have-nots" is a challenge that rests squarely on teachers and librarians. The challenge is to ensure that all students learn to know when they need information and how to identify, locate, evaluate and effectively use that information to address the issue or problem at hand. Providing people with the latter competencies must be an educational priority for the twenty-first century and such competencies are included in the term "information literacy."

Interest and a commitment to information literacy have grown largely as a grassroots effort in the United States over the past decade. Yet, the impact on student learning remains uneven across many schools and campuses and nonexistent in others. Increasingly, however, information literacy is attracting the attention of educational leaders. For example, in the spring of 2000, the Executive Board of the American Association for Higher Education endorsed information literacy as a policy issue. (The only other policy issue to have been so endorsed is one on diversity.) Regional accrediting agencies such Middle States Commission and the Western Association of Schools and Colleges have placed emphasis on information literacy as essential for undergraduate learning. At the school level, several states have fostered information literacy statewide (i.e., Colorado, Kentucky, Minnesota, and Utah). Even management guru Peter Drucker has written frequently on the need for business leaders to acquire such abilities, but he started talking about this more than a decade ago.4

Interest in information literacy is also of growing concern in other countries. As countries recognize their need for a lifelong learning workforce, interest in information literacy comes to the forefront. Now under the auspices of UNESCO, The National Commission on Libraries and Information Science, and the National Forum on Information Literacy, an effort is underway to hold an international leadership conference on information literacy. Planners will meet in Washington, D.C in October. Representing a broad array of professionals, the group will address details for a meeting of experts to be held in spring 2002 and which itself will be charged with detailed planning for undertaking a larger and more ambitious worldwide international conference that will be held late in 2002.

The question is, what does all this mean to teachers and librarians today? First, there is the wonder of it. Information literacy is a grassroots effort that has continued to grow and expand in its influence. This is in contrast to the 1980s education-reform reports issued by experts who failed to recognize the arrival of the Information Age and, therefore, only focused on improving business as usual (e.g., longer school years, higher salaries for teachers, more homework, and so on). Many teachers and

librarians in the classrooms of our nation, however, quickly understood that the world has changed, and they realized the inherent strengths of information literacy both at the conceptual and the implementation levels. At the conceptual level, information literacy is the liberal arts concept updated for the Information Age. It is concerned not with teaching something to students but having students acquire lifelong learning abilities. It is concerned that students be able to learn to improve the quality of their lives and to be successful in business long after they finish whatever level of schooling they undertake. This ability is understood as essential in a world characterized by an information explosion, rapidly changing technology, and a work environment where nothing is more constant than change.

On the implementation level, librarians and teachers have also long understood that any one lecture, any one textbook or workbook cannot be a good match for all students in any given class. Students come to classrooms with different learning experiences; they have different preferred learning styles, and they learn at different rates. Acquiring information literacy skills requires resource-based learning, i.e., students are not held to learning from the same information source but are encouraged to use the universe of information available in the real world to find information to address the task at hand. A resource-based learning approach is at the heart of problem-solving and service learning. It is learning by discovery. It is what puts the fun back into learning.

But all is not rosy. There are still many roadblocks between where we are in the United States now and where we need to be, where we can ensure that all students will have the opportunity to develop information literacy abilities. The following list highlights the roadblocks most frequently encountered.

1. **A learning issue**. Information literacy must not be seen as a library issue. It is a learning issue. Students do not become information literate unless class assignments are structured to insure a resource-based learning approach.

2. **Availability of information resources**. Resource-based learning cannot occur apart from students' having access to a wide range of information resources. Students not only need to know when to go to an expert, a local business resource, a video, a book or print journal, and so on, they need to have access to them.

3. **It is not library instruction**. Unfortunately, far too many librarians and teachers say "information literacy" but are thinking "library instruction." Library instruction is teaching things (e.g., search strategies, databases, reference materials) to students; information literacy is what students can do. Library instruction does not require a rethinking of class assignments, but mastering information literacy abilities does.

4. **The need to institutionalize**. Many schools and colleges are at the point where they can point with pride to resource-based learning and documented student learning outcomes. Unfortunately, in most cases these successes only reach a limited number of their students. Successfully creating an information-literate society will require across-the-board curriculum planning that ensures that learning experiences are systematically built upon throughout all students' years of study.

5. **Assessment**. This is an area in the United States where increasing attention is being paid. Clearly, to improve and advance efforts, there needs to be an ongoing assessment of existing programs and of students' improved abilities as savvy information consumers. Emphasis should be on authentic assessment rather than on pre- and post-library skills tests. For example, are students' research and projects of a higher quality?

6. **Partnering**. Ultimately, nothing is more important to the continued success of information literacy efforts than increased partnering among classroom teachers and librarians.

Despite these roadblocks, the wonderful news is that more students in more schools and colleges are having more opportunities to become information literate. The reason for this progress is inherent in what attracts people to work in educational settings. Neither teachers nor librarians enter their fields to become rich nor are they likely to stay within their chosen field with monetary goals in mind. Both groups have entered their professions because they care to make a difference in the lives of

people who are entrusted to them. They are motivated to help people make better lives for themselves and for society in general. Therefore, it is not a far-fetched hope that information literacy, as a grassroots effort, will continue to grow and prosper in the months and years ahead.

The important role of national and international efforts in closing the information divide in today's digital society has been given greater urgency by the recent terrorist attacks in our country, for surely it is impossible to eliminate hatred and terrorism without addressing the extreme inequalities that exist among individuals and nations. Hopefully, this urgency to lessen the information divide will also strengthen the effectiveness of teachers and librarians as they seek the support and resources needed to move ahead and institutionalize information literacy across the curriculums of their institutions. The ultimate benefactors will be the children of today and tomorrow.

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[1] The opening paragraph of this article is adapted from the initial proposal for the International Leadership Conference on Information Literacy

[2] For more information on the National Forum on Information Literacy and to read further about information literacy, see the Forum's website at www.infolit.org

[3] Drucker, Peter, "Be Data Literate—Know What to Know," *The Wall Street Journal*, December 1, 1992.

[4] Breivik, Patricia Senn, "Information Literacy and the Engaged Campus." AAHE BULLETIN, November 2000.

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S.O.S. for Information Literacy: A Tool for Enhancing Information Skills Instruction

By
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&
Marilyn P. Arnone, President
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Introduction

Information literacy standards, as described in *Information Power: Building Partnerships for Learning* (AASL & AECT, 1998), specify the importance of (1) integrating information literacy with the content and objectives of the school's curriculum and (2) teacher-library media specialist collaborative instructional planning and curriculum development to guarantee the effective teaching of information skills. Many teachers and library media specialists are asking for guidance in the most effective ways to fulfill these goals.

While the standards and the numerous available information literacy models describe in detail *what* to teach, there are far fewer resources that demonstrate *how* to teach information literacy skills, how to integrate them with the curriculum, and how to collaborate for planning and delivering effective information skills lessons. In addition, there are no support tools for improving teaching in this area that offer the power of capturing first-hand examples of model teaching and digitally storing specific video examples in a quickly accessible manner.

S.O.S. for Information Literacy is a project funded by a U.S. Department of Education Small Business Innovation Research (SBIR) grant, awarded in the fall of 2000 to Dr. Marilyn P. Arnone, President of Creative Media Solutions, Inc. of Philadelphia, Pennsylvania, and adjunct assistant professor at the School of Information Studies at Syracuse University. Professor Ruth Small of the School of Information Studies is co-author of the grant proposal and serves as Senior Project Consultant. The goal of this project is to make a significant contribution toward achieving the goals described in *Information Power* by helping elementary educators design and deliver high quality information literacy skills instruction to their students. The S.O.S. team has presented the project to a variety of audiences, including a recent invitation from Patricia Breivik to present S.O.S. to the National Forum on Information Literacy in Washington, D.C.

Why Is S.O.S. Needed?

Many educators have told us that, despite careful lesson planning, their lessons are often less than successful. We believe that to be successful the content of a lesson must not only be appropriate, timely, accurate, and so on, but it must also be presented in a way that motivates students. Motivation (or the lack thereof) can make or break a teaching episode (Small, 1997). Therefore we incorporate our model, the *Motivation Overlay for Information Skills Instruction* (Small & Arnone, 2000), into the S.O.S. tool.

The Motivation Overlay is not a new information skills model but rather a systematic framework for designing motivation into information skills instruction in a way that excites students about research and life-long learning. As its name suggests, it serves as an "overlay" to existing information literacy models. The model identifies three general research stages and specifies eight general information skills (synthesized from existing information literacy models) and nine motivational goals

related to the three research stages. In addition, each of the motivational goals is linked to several motivational teaching techniques and strategies, forming what Small and Arnone call a *Motivation Toolkit*. The Motivation Toolkit has been widely used for designing exciting information literacy skills lessons at all levels (Moyer & Small, 2001).

At the beginning of and during the development of the *S.O.S.* prototype, Small and Arnone conducted a front-end analysis and iterative design research to determine how best to design an information system that meets the needs of K-6 teachers and library media specialists. The primary data collection methods were (1) a survey of college educators and leaders in the field, (2) an online questionnaire, focus groups, and telephone interviews with practitioners, and (3) an in-house technical evaluation with programmers and consultants. Their research provided invaluable information and guidance for development of appropriate content and desired functionality for *S.O.S.*

What Is S.O.S.?

S.O.S. incorporates the most current thinking on the teaching of information skills (e.g., Kuhlthau, 1993; Vandergrift, 1994) and fosters collaborative partnerships between elementary teachers and library media specialists (who in the past have often worked toward the same goals separately) by promoting the teaching of information skills *in the context of classroom assignments and research projects*, thereby increasing the relevance of learning such skills. S.O.S. includes video clips and multimedia that illustrate real-life examples of collaborative planning and teaching of information skills lessons that are integrated with the curriculum.

S.O.S. (Situations, Outcomes, and Strategies) is a Web-based tool that combines access to video and multimedia demonstrations with sophisticated search technologies. *S.O.S.* prescribes potentially successful teaching strategies for achieving desired teaching outcomes under specific situational variables. Once an educator has identified a specific situation (grade level, subject area, national standards) and desired outcome(s) (information skills and sub-skills, motivational goals), then the *S.O.S.* system generates one or more suggested teaching strategies, many of which are linked to video demonstrations, lesson plans, handouts, and other relevant teaching materials and Internet resources. Furthermore, various *types* of videos may be found in *S.O.S.*, including the following: "In Action" videos showing real-life practitioners implementing a particular strategy; "Reflections," in which educators reflect on their use of a particular strategy or successful collaborative effort; and "From a Student's Perspective," in which elementary students talk about their learning when taught with a particular strategy.

A Scenario

Here's a hypothetical example of how *S.O.S.* might work.

> *Juanita Sanchez is a fifth grade teacher in a small rural school district in Massachusetts. Her district's elementary social studies curriculum (and state standards) specifies that students learn about the history of their state. Juanita is beginning her unit on history with a lesson and assignment that requires students to explore what life was like in colonial Massachusetts. Although her students learned some facts about their state's history in earlier grades, they had never done formal research on the topic. When Juanita informed them that they would be doing research on the topic of family life in colonial Massachusetts, many of the students reacted with expressions of anxiety, uncertainty, and boredom.*
>
> *While Juanita knows the curriculum and content-related goals for her lesson, she is unsure about what information literacy learning outcomes she should stress and how to teach her lesson in a way that not only makes this initial research experience engaging and relevant for her students but also builds their confidence as budding researchers. So Juanita goes to her classroom computer to access S.O.S.*
>
> *She inputs the Situation variables (e.g. fourth grade, social studies), selects a desired information literacy skill Outcome (Definition: Determining the amount and type of information needed to complete*

the task or assignment) from the list provided, and clicks on the Strategies button to retrieve all related teaching ideas for her lesson. Immediately, the system displays eighteen hits of appropriate instructional Strategies that target the specific information literacy skill she plans on teaching. Juanita sees that several strategies are linked to video segments, one of which demonstrates the strategy "in action" implemented by an elementary educator and the other presents a student describing what it was like to learn when his teacher used that strategy. Some of the strategies also link to other relevant resources including photographs, text descriptions, Web links, and complete lesson plans that allow Juanita to see the strategy in context.

Juanita quickly peruses the list and begins to select the strategies she would like to include with her lesson. One strategy links to a video segment of a 5th grade classroom teacher/library media specialist team from New York teaching a lesson with a similar theme: Life in Colonial New York. As the library media specialist teaches students how to determine the amount and type of information needed, the classroom teacher reiterates the parameters of the research assignment to students. Another strategy links to a video segment showing a student describing his perspective on a lesson taught by the library media specialist in which his school's library media specialists helped his class locate and use a database containing state historical information.

Juanita bookmarks the strategies she likes, prints out a copy of a great lesson plan and downloads a linked set of original pictures of students reenacting an event that took place in colonial Jamestown. When she shows the team teaching video to Dan Curtis, her school's library media specialist, they both decide to schedule a meeting to collaboratively plan and teach the lesson and agree to use S.O.S.'s online lesson planner to facilitate the design of their lesson.

While this example illustrates one way in which Juanita might use *S.O.S* to fulfill her instructional need, she could use a number of other search strategies to find ideas for her lesson. For example, she could search each *S.O.S.* database directly, i.e., searching by teaching strategies, lesson plans, videos, information literacy standards, or topics. The flexibility and broad scope of *S.O.S.* provides a wide range of choices for instructional design.

Conclusion

S.O.S. for Information Literacy promises to be a unique, state-of-the art information system for teaching information literacy skills that integrates interactive multimedia, the Internet, cutting-edge information technologies, and innovative instructional techniques. As a tool, *S.O.S.* will provide much-needed help to educators for meeting the national information literacy standards described in *Information Power* and for preparing our children to be successful citizens of the 21st century.

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Recent Literature on Information Literacy and Distance Education

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Here is a sampling of recent literature on information literacy and distance education collected and abstracted by ERIC Clearinghouse on Information and Technology (ERIC/IT) for the ERIC database. Compiled by Joan Kad, database coordinator for the clearinghouse, this list features only those recent documents that one may access via the Internet in FULL TEXT.

The ERIC database now includes over 67,000 abstracts in the areas of library and information science and educational technology, as well as the full text of many of these difficult to find research and technical reports, conference papers and project descriptions, that will help you in your research or teaching efforts. The ERIC database provides free and instant access 24/7 via the Internet to its entire database of over one million abstracts of education-related journal articles and documents, including the most recent. Professors, researchers, librarians, teachers…struggling to keep up on all the latest journals? Too busy to even do a search of our database or concerned that you might miss something? We'll search the database for you…just contact our free service, AskERIC, and receive the information you need within two days!

INFORMATION LITERACY

The Future Is Now: Quality Library Service in Colorado Strategic Plan 2001-2004
By William J. Moloney and Nancy M. Bolt
Abstract: This Strategic Plan for library development in Colorado includes a specific set of strategic directions for the next four years with suggested key activities to implement them, as well as a set of timeless principles upon which library development and service are based. The Long Range Planning Strategic Directions, 2001-2004, are outlined with key activities for 14 areas: Advocacy; Funding; Standards-Based Education; Information Literacy; Family Literacy and Reading Readiness; Retention and Recruitment; Continuing Education; Service to Aging Populations; Services to Underserved Populations; Services to Minorities; Technology and Connectivity Planning; Access to Information; Delivery of Information Resources and Materials; and Colorado Library Law. Ongoing professional principles that should serve as a foundation for strong library services provided to the resident of Colorado, outlined in an appendix, focus on three main areas: leadership, services, and resource sharing. Three additional appendices include the Library Bill of Rights, listing of principles that libraries in the United States should embrace, and glossary and definitions.
Publication Date: 2001
Availability: Colorado State Library; for full text: http://www.cde.state.co.us/cdelib/download/pdf/Future.pdf.

Information Literacy for the Skeptical Library Director
By Patricia S. Breivik
Abstract: This paper begins by providing background on the information literacy movement, including the educational reform efforts of the 1980s, a higher education summit conference, and the 1989 ALA (American Library Association) Presidential Committee on Information Literacy Final Report. Other highlights include: the information literacy triangle; providing universal access by getting the Internet into all schools and public libraries; the need for funding to educate people to take advantage of technological advancements; definitions of information literacy; a UNESCO report addressing the importance of lifelong learning; the Global Knowledge Partnership; and the efforts of the National Forum on Information Literacy. The following practical steps for academic library directors are suggested: (1) take time to think through the concept of information literacy; (2) ask questions

about information literacy on campus; (3) find out what the barriers to information literacy are; and (4) celebrate successes.
Publication Date: 2000
Availability: For full text:
http://educate.lib.chalmers.se/iatul/proceedcontents/qutpap/breivik_full.html
Comments: In: Virtual Libraries: Virtual Communities: Abstracts, Fulltext Documents and PowerPoint Presentations of Papers and Demos Given at the International Association of Technological University Libraries (IATUL) Conference (Brisbane, Queensland, Australia, July 3-7, 2000).

Development of Information Literacy: A Plan
By Helen Hasan
Abstract: This paper describes the development of information literacy in a secondary school setting. The first section discusses the definition of information literacy, the key elements in the development of information literacy, characteristics of an information literate person, the main factors in the environment for information literacy, monitoring of information literacy, and challenges for the development of information literacy. The second section presents an overview of Marcellin College (Australia), a Catholic secondary school for boys, including the school's development plan and its "Beyond 2000" strategic plan. The third section outlines the school library's initial proposal for the development of information literacy within the school's development plan.
Publication Date: 2000
Availability: Full text:
http://www.alia.org.au/conferences/alia2000/proceedings/helen.hasan.html
Comments: In: ALIA 2000. Capitalising on Knowledge: The Information Profession in the 21st Century (Canberra, Australia, October 23-36, 2000).

Performance Measures, Benchmarking and Value
By Felicity McGregor
Abstract: This paper discusses performance measurement in university libraries, based on examples from the University of Wollongong (UoW) in Australia. The introduction highlights the integration of information literacy into the curriculum and the outcomes of a 1998 UoW student satisfaction survey. The first section considers performance indicators in context, including the UoW's use of the Australian Quality Council's "Australian Business Excellence Framework." The second section describes the development of performance indicators, including a framework that provides expectations/critical success factors and performance indicators for several stakeholders (i.e., university executive, clients, staff, suppliers, and community). The third section addresses benchmarking, stressing the importance of benchmarking as a means of identifying best practice and of continuously improving all aspects of performance. The following uses of performance measurement are identified: to indicate the library or information services' alignment with broader organizational goals; to demonstrate the integration of information services with the key activities of the organization or community; and to support the library's position as the organization's primary information manager and service provider.
Publication Date: 2000
Availability: Full text:
http://www.alia.org.au/conferences/alia2000/proceedings/felicity.mcgregor.html
Comments: In: ALIA 2000. Capitalising on Knowledge: The Information Profession in the 21st Century (Canberra, Australia, October 23-36, 2000).

ALIA 2000. Capitalising on Knowledge: The Information Profession in the 21st Century (Canberra, Australia, October 23-36, 2000)
Abstract: This proceeding of the Australian Library and Information Association (ALIA) 2000 conference contains 64 papers presented at the main conference and 12 papers presented at the fringe conference. Topics covered include: the 21st century information environment; user perspectives of the future of the Internet; the user interface; public libraries in a wired world; censorship in public libraries; knowledge management; the impact of change on research libraries; building a knowledge-based economy and society; value and performance in the information technology society; adding value to services at the State Library of New South Wales; the policy and practice of fee-based service; library industry statistics; adult education; intellectual property--access and protection; infrastructure and convergence; libraries and literary outcomes; information provider roles; access to library services; development of information literacy; libraries, knowledge management, and higher education in an electronic environment; the impact of change at the Melbourne University Library; views of technology futures; information needs in the consumer society; upgrading libraries; a public library perspective on

lifelong learning; ensuring an educational role for libraries in the information society; the greying of the teacher librarian; access to services for rural and remote communities; resource discovery within the networked "hybrid" library; performance measures, benchmarking, and value; leadership and management skills and the information profession; self service and the function of the new intermediary; educational implications of material presented at ALIA 2000; reference in the e-library; the market for information; flexible learning developments; privacy aspects of intellectual property; statistics on the online society; enabling best practice recordkeeping in the digital age; librarians working with academics to close the information gap; content of the future; flexible learning in higher education; skills for systems support; digital media for historians and librarians; making the most of the World Wide Web; the information professional of the future; the role of libraries in providing online services for people with disabilities; the impact of copyright changes on libraries; the need for network supportability for libraries; mentoring relationships; career planning; the library professional and the professional association; innovation, flexibility, and professionalism; and skills development for a successful career.
Publication Date: 2000
Availability: Full text: http://www.alia.org.au/conferences/alia2000/

Parent's Guide to the Internet, Revised 2000
Abstract: This second edition of the "Parent's Guide to the Internet" is intended to help parents--regardless of their level of technological know-how--make use of the online world as an important educational tool. This booklet provides parents with basic information about how to use the computer to find information and communicate with others. It describes what is needed to get started on the Internet and points to some of the many resources available online for parents and children. The booklet discusses: benefits of using the Internet; computer hardware and software basics; choosing an Internet service provide or online service; basics for exploring the World Wide Web and communicating with others on the Internet; Internet safety tips--to ensure that children have safe, productive, and enjoyable experiences on the Internet; encouraging information literacy; supporting school use of technology; and sample Internet sites. A glossary of computer and Internet terms is provided.
Publication Date: 2000
Availability: Education Department Publications. For full text: http://www.ed.gov/pubs/edpubs.html

The Impact of Change on Research Libraries: The State Library of New South Wales
By Maxine Brodie
Abstract: This paper discusses the impact of change on the State Library of New South Wales (Australia), a large public research library charged with the care and continuing use of a documentary heritage. The first section provides background on the State Library, including history, collection, mission, and use. The second section describes library clients, including four distinct client groups (i.e., professional readers, personal interest readers, work/business readers, and students), development of a three-tiered service model, promotion and development of information literacy. The third section describes collections, including the addition of items to the library's World Wide Web catalog, the preservation of paper and electronic resources, and collection development policy. The fourth section considers the importance of two key capabilities, i.e., the competencies of library staff, and the success of collaborations with other organizations. The fifth section addresses context, presenting libraries of documentary heritage as part of a broad canvas of political, economic, and social values.
Publication Date: 2000
Availability: Full text: http://www.alia.org.au/conferences/alia2000/proceedings/maxine.brodie.html
Comments: In: ALIA 2000. Capitalising on Knowledge: The Information Profession in the 21st Century (Canberra, Australia, October 23-36, 2000).

Forward with Imagination: Innovative Library Client Services for the 21st Century
By Alan Bundy
Abstract: This paper considers innovation in academic libraries. The first part explores the definition and nature of innovation and the literature relevant to academic libraries in particular. In the second part, the outcomes of a search of library World Wide Web sites and a survey of IATUL (International Association of Technological University Libraries) and Australasian academic libraries are detailed. Results in the following areas are presented: innovations since 1995 related to

physical facilities, electronic and nonelectronic information services, information literacy, community access, and library cooperation; innovation specified in mission, objectives, or strategic plan; staff development program facilitating innovation and enterprise culture; and budget provision for innovation. These results are presented first for IATUL members excluding Australia and New Zealand (n=49), then for Australia and New Zealand libraries (n=39). The third part reviews the issues that need to be considered by libraries seeking to be innovative and learning organizations in the 21st century.
Publication Date: 2000
Availability: For full text:
http://educate.lib.chalmers.se/iatul/proceedcontents/qutpap/bundy_full.html
Comments: In: Virtual Libraries: Virtual Communities: Abstracts, Fulltext Documents and PowerPoint Presentations of Papers and Demos Given at the International Association of Technological University Libraries (IATUL) Conference (Brisbane, Queensland, Australia, July 3-7, 2000).

DISTANCE EDUCATION

Making the Transition: Helping Teachers to Teach Online
By Rena M. and Keith Pratt
Abstract: Teaching in the cyberspace classroom requires moving beyond old models of pedagogy into new practices that are more facilitative. It involves much more than simply taking old models of pedagogy and transferring them to a different medium. Unlike the face-to-face classroom, in online distance education, attention needs to be paid to the development of a sense of community within the group of participants in order for the learning process to be successful. The transition to the cyberspace classroom can be successfully achieved if attention is paid to several key areas. These include: ensuring access to and familiarity with the technology in use; establishing guidelines and procedures which are relatively loose and free-flowing, and generated with significant input from participants; striving to achieve maximum participation and "buy-in" from the participants; promoting collaborative learning; and creating a double or triple loop in the learning process to enable participants to reflect on their learning process. All of these practices significantly contribute to the development of an online learning community, a powerful tool for enhancing the learning experience. Each of these is reviewed in detail in the paper.
Publication Date: 2000
Availability: For full text:
http://www.educause.edu/conference/e2000/proceedings.html;
http://www.educause.edu/asp/doclib/abstract.asp?ID=EDU0006.
Comments: In: EDUCAUSE 2000: Thinking it Through. Proceedings of the EDUCAUSE Annual Conference (Nashville, TN, Oct. 10-13, 2000).

Faculty/Student Interaction at a Distance: Seeking Balance
By Kathy S. Gresh and Susan Mrozowski
Abstract: Interaction between instructors and learners is a critical element in the learning process during an online course (Moore 1993; Offir 2000). The desire to engage the students in meaningful and challenging interaction would appear to require an intensive time commitment by the faculty. This paper presents methods that not only engage the learner but also relieve the stress that time constraints place on the online instructor. In particular, examples from the Internet-based Master in Public Health Program of the Johns Hopkins School of Hygiene and Public Health (JHSPH) are used to illustrate these processes and techniques. Over the past four years of online course development, JHSPH has found that faculty can maintain quality interaction with learners without significantly increasing the normal on-site instructor-learner interaction time. Dialogue is richer (particularly in large survey classes) and, by strategically integrating media into their on-site classes also, they can reduce the amount of time spent in the routine work of delivering on-site classes. Recurrent questions can be tracked electronically and either used to improve content or posted in frequently asked question (FAQ) areas. Many on-site administrative issues can be handled electronically rather than in office hours. Office hours can be spent on more substantive issues, such as career planning. Although developing an online course still requires a great deal of time by faculty and distance education staff, creative, strategic planning can result in online courses that achieve a successful and quality faculty/student interaction without undue burden on faculty time.
Publication Date: 2000
Availability: For full text:
http://www.educause.edu/conference/e2000/proceedings.html'
http://www.educause.edu/asp/doclib/abstract.asp?ID=EDU0024.

Comments: In: EDUCAUSE 2000: Thinking it Through. Proceedings of the EDUCAUSE Annual Conference (Nashville, TN, Oct. 10-13, 2000).

Technology Plan: University of Wisconsin Sheboygan
Abstract: The University of Wisconsin Sheboygan is committed to developing and maintaining a computing environment that supports the mission of the campus and the UW Colleges. Effective use of computer technology is an important part of the University's primary mission of teaching today's university students and serving local communities. Such an environment requires up-to-date software and hardware, convenient access to information resources, and also involves issues of reliability, security, connectivity, and adequate staffing and support. The University strives to enable faculty, staff, and students to use computing as an informational tool and resource, an enhancement to teaching and learning, and as a device to increase productivity. Following this Technology Plan statement, specific objectives for each of the following Instructional Technology Goals are listed: (1) Provide convenient access and resources for the entire campus community; (2) Allocate adequate resources for Instructional Technology Services; (3) Provide user support through Instructional Technology Services or local campus experts; (4) Provide technical support for campus computer equipment; (5) Ensure ongoing support and updating of computer resources; and (6) Distance education.
Publication Date: 2000
Availability: For full text: http://sheboygan.uwc.edu/itplan00.htm.

WebNet 2000 World Conference on the WWW and Internet Proceedings (San Antonio, Texas, October 30 - November 4th, 2000)
Edited by Gordon Davies and Charles Owen
Abstract: The 2000 WebNet conference addressed research, new developments, and experiences related to the Internet and World Wide Web. The 319 contributions of WebNet 2000 contained in this proceedings comprise the full and short papers accepted for presentation at the conference, as well as poster/demonstration abstracts. Major topics covered include: commercial, business, professional, and community applications; education applications; electronic publishing and digital libraries; ergonomic, interface, and cognitive issues; general Web tools and facilities; medical applications of the Web; personal applications and environments; societal issues, including legal, standards, and international issues; and Web technical facilities.
Publication Date: 2000
Availability: Association for the Advancement of Computing in Education (AACE), P.O. Box 3728, Norfolk, VA 23514-3728; Web site: www.aace.org

ICCE/ICCAI 2000 Invited Papers
Abstract: This document contains the full text of the following invited papers from ICCE/ICCAI 2000 (International Conference on Computers in Education/International Conference on Computer-Assisted Instruction): (1) "Matching the Infoverse: About Knowledge Networks, Knowledge Workers, and Knowledge Robots" (Joachim Hasebrook); (2) "Learning on the Internet: Taking the Ecology Metaphor Further" (Chee-Kit Looi); (3) "What Can We Learn from the Systems We Build? From Providing Support to Students to Providing Support to Teachers" (Pierre Tchounikine and Daniel Luzzati); (4) "Human Activity in Learning Societies" (Robert Lewis); and (5) "Towards Intelligent Media-Oriented Distance Learning and Education Environments" (Toshio Okamoto, Alexandra Cristea, and Mizue Kayama). Abstracts of the following invited papers are also included: "The Role of Emotional Agents in Intelligent Tutoring Systems" (Claude Frasson); "Web Portfolios: Tools for Monitoring and Assessing Learning Process" (Gwo-Dong Chen); "Can and Should Teaching Systems Mimic Human Teachers?" (Benedict du Boulay); and "Research on Internet Addiction: A Review and Further Work" (Chien Chou).
Publication Date: 2000
Availability: Full text: http://icce2000.nthu.edu.tw.
Comments: In: Learning Societies in the New Millennium: Creativity, Caring & Commitments. International Conference on Computers in Education/International Conference on Computer-Assisted Instruction (Taipei, Taiwan, November 21-24, 2000).

Virtual Classroom for Business Planning Formulation
By J. Osorio, J., E. Rubio-Royo and A. Ocon
Abstract: One of the most promising possibilities of the World Wide Web resides in its potential to support distance education. In 1996, the University of Las Palmas de Gran Canaria developed the "INNOVA Project" in order to promote Web-based training and learning. As a result, the Virtual Classroom Interface (IVA) was created.

Several software tools for developing Web-based training were analyzed, and WebCT (World Wide Web Course Tools, University of British Columbia) was chosen as the main development tool. IVA is a WebCT-based common interface that works as a rapid online course development tool. It provides an organized set of educational and administrative tools to make it easier for faculty to implement online courses. One supporting computer application developed on this platform is called SISTRAT. SISTRAT methodology aims at formally supporting the strategic planning process, aiding students in the business administration curriculum in simulating strategic analysis and guiding the students on a continuous basis through the different stages that conform to a strategic plan. The SISTRAT course is organized around one main homepage that is the entry point of the course. The SISTRAT course incorporates not only the general IVA features, but also a set of specific items pertaining to strategic planning. IVA educational tools included in the SISTRAT course include: course bulletin board; electronic mail; chat tool; student self-evaluation; glossary; page references; and progress tracking tool.
Publication Date: 1999
Availability: For full text: http://www.hut.fi/events/eunis99/Asession/A51.html; Track A: http://www.hut.fi/events/eunis99/TrackA.html.
Comments: In EUNIS '99: Information Technology Shaping European Universities. Proceedings of the European University Information Systems International Conference (5th, Espoo, Finland, June 7-9, 1999).

The Library of the University of South Africa's Marketing Voyage of Discovery through Conventional Marketing Channels and the Internet
By Kathy Kunneke
Abstract: This paper describes the experiences with marketing, a new concept at the Library at the University of South Africa (Unisa) which is the largest university in South Africa and one of the largest distance education institutions in the world. Following a discussion of marketing of the tertiary library and the service marketing triangle (organization and staff; market and organization; and the traditional marketing mix of product, price, place and promotion), the marketing plan of the Unisa Library is described. Highlights include: target markets identified; the communication strategy; use of conventional communication channels and Web marketing; and Web marketing tools, including gateway advertising, product information and recommendation, establishing customer discussion panels and creating a dialogue, targeting specific demographic groups, evaluating gateway success, pricing, getting listed in directories, joining industry hubsites, e-commerce, and internal marketing.
Publication Date: 1999
Availability: Web site: http://educate.lib.chalmers.se/IATUL/proceedcontents/chanpap/kunneke.html
Comments: In: The Future of Libraries in Human Communication: Abstracts and Fulltext Documents of Papers and Demos Given at the International Association of Technological University Libraries (IATUL) Conference (Chania, Greece, May 17-21, 1999).

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ERIC/IT News

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VRD's Third Annual Conference Focuses on Setting Standards in Digital Reference

ERIC/IT Launches a Full-Text Database

The world's largest and most frequently used database in the field of education, the ERIC database already provides free and instant access 24/7 to over one million *abstracts* of education-related journal articles and documents via the Internet, including more than 67,000 in the areas of educational technology and library and information science collected by ERIC/IT.

As an added free service, the ERIC Clearinghouse on Information and Technology has now launched one of the first *full-text* databases in the national ERIC system. Users can now search our Web site (www.ericit.org) for more than 1,000 of the *latest* research and technical reports, conference papers, project descriptions, and other documents in the fields of library science and educational technology, and, with a simple click of the mouse, obtain the full text instantly.

Documents are added continuously, so visit our Web site frequently to access the full text of some of the best—and most recent—literature in your field!

VRD's Third Annual Conference Focuses on Setting Standards in Digital Reference

By Abby Kasowitz

The Virtual Reference Desk, a special project of the ERIC Clearinghouse on Information & Technology, will hold its 3rd Annual Digital Reference Conference on November 12-13, 2001 in Orlando, Florida. This year's conference, "Setting Standards and Making It Real," explores issues in delivering effective Internet-based reference service in a variety of contexts and setting standards to ensure quality. Specific topics include digital reference standards, technology, management, evaluation, training, collaboration, real-time service, and other related issues.

Keynote speakers include Clifford Lynch, Director of the Coalition of Networked Information (CNI); Susan McGlamery, Coordinator for Reference Services for the Metropolitan Cooperative Library System; and Nancy O'Neill, Principal Librarian for Reference Services, Santa Monica Public Library. The conference includes over 50 breakout sessions led by representatives from organizations and services such as AskERIC, Library of Congress, Internet Public Library, OCLC, Cleveland Public Library, Massachusetts Institute of Technology, Eisenhower National Clearinghouse for Mathematics and Science Education, and the National Agricultural Library.

Two special workshops will be offered in conjunction with the conference: "Measuring and Assessing the Quality of Digital Reference Services," offered by the Information Use Management and Policy Institute at the Florida State University School of Information Studies; and "Building a Real-Time Reference Service," offered by SOLINET (Southeastern Library Network, Inc.). A reception and awards ceremony will be held November 12 to recognize leaders in the emerging digital reference field, and an exhibit will showcase organizations and companies offering

digital reference-related products and services

The conference is open to everyone with an interest in developing and implementing digital reference services, including librarians, information professionals, and others from libraries of all types, government agencies, business, and specialized AskA services. Registration information is available at: http://vrd.org/conferences/VRD2001/registration.shtml

The VRD 2001 Conference is hosted by the Information Institute of Syracuse, Syracuse University's School of Information Studies, SOLINET, and the Information Institute at the School of Information Studies, Florida State University. Sponsors include the U.S. Department of Education, The ERIC Clearinghouse on Information & Technology, The Library of Congress, The American Library Association's Reference and User Services Association, and Syracuse University's School of Information Studies.

For more information on the VRD 2001 Conference, visit http://vrd.org/conferences/VRD2001/ or contact vrdconf@vrd.org.

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Educational Media and Technology Yearbook

Facets of Digital Reference: Proceedings of the Second Annual Conference of the Virtual Reference Desk

Use of Human Intermediation in Information Problem Solving: The Users' Perspective

Educational Media and Technology Yearbook 2001 Volume 26

Edited by Robert Maribe Branch and Mary Ann Fitzgerald

Reviews of previous editions:
"Vital to those in the fields of media and technology."
--School Library Media Quarterly
"The standard guide to the year's developments, resources and trends."
--Teacher Librarian

Exploring current issues each year for the last quarter of a century, this annual volume helps media and technology professions keep abreast of a changing and expanding field. Focusing on the meaningful integration of technology, this particular volume begins with Michael Molenda and Phillip Harris assessing the current status of instructional technology in America in corporate training and development, higher education, and K-12 education. As a framework for their observations they chose several broad issues that cut across sectors and have been of perennial interest in the literature in the instructional technology (IT) field: rate of adoption of different forms of technology for delivery of instruction, institutional constraints on acceptance of IT, and challenges to the existing paradigms. Ten original articles follow on specific aspects of this rapidly developing field, many with a particular focus on school library media.

Other features include detailed listings of United States and Canadian associations and graduate schools as well as a mediagraphy of print and nonprint resources. This book will also bring you up to date on the current activities and accomplishments of those organizations and associations dedicated to the advancement of educational communications and technology.

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Facets of Digital Reference: Proceedings of the Second Annual Conference of the Virtual

Reference Desk

October 16-17, 2000, Seattle, Washington

Edited by Abby S. Kasowitz and Joan Stahl

Available in FULL TEXT online at the Virtual Reference Desk's Web site.

Learn of the most current issues in the field of digital reference and of the most promising developments for the future with *Facets of Digital Reference*. This free, online publication features work presented at an annual, international conference for library and information professionals on Internet-based reference service. This second conference of the Virtual Reference Desk (VRD) brought together some of the best and brightest professionals in digital reference--representing public, academic, and government libraries, as well as subject-specific AskA services—from around the United States and Canada and from far away as Australia, Denmark, and Japan. Now, from the comfort of your own home or office, you can read their work.

The dozens of papers and presentations included in *Facets of Digital Reference* explore key issues facing practitioners and researchers, such as the ability of services to grow exponentially in response to user demands; quality criteria for expert responses and evaluation methods; the proliferation of new commercial services and increased competition for libraries; and the use of new software technologies and tools to help automate and streamline Internet-based information exchanges. These proceedings offer a snapshot of current services, research initiatives, and products that help define the quickly growing field of digital reference.

The Virtual Reference Desk is a special project of the ERIC Clearinghouse on Information & Technology.

VRD's third annual conference will be held November 12-13, 2001 in Orlando, Florida, contributing to the ongoing dialog on digital reference and to the efforts in the development of quality and technical standards.

Use of Human Intermediation in Information Problem Solving: The Users' Perspective

By Makiko Miwa, PhD

This book will enhance your understanding of the information problem solving (IPS) behavior of users, particularly as it relates to human intermediation and the use of information retrieval (IR) systems. Using the AskERIC Q&A Service, an online digital reference service, as an example of human intermediation, the author explores why and in what situations people seek help from others in solving their information problems, making distinctions among different kinds of IPS tasks requested of human intermediaries. Filling a gap in the research literature, this book explores human intermediation from the users' perspective rather than that of information professionals, taking into consideration more fully social and environmental situations related to users' information problem solving processes. *Use of Human Intermediation in Information Problem Solving* offers researchers important situational variables for further study, while providing practitioners with information they need to improve services and IR systems design.

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New ERIC Digests

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New and forthcoming ERIC Digests, published by the ERIC Clearinghouse on Information & Technology, include such topics as the hidden Web; controversial copyright issues affecting libraries and their patrons across the country; the latest research on the link between school library media programs and academic achievement; trends in digital reference services; the National Science Foundation's plans for a major, digital library for education; and the important ways small libraries can function as large ones.

ERIC Digests are in the public domain and may be freely reproduced and disseminated.

Uncovering the Hidden Web, Part I:
Finding What the Search Engines Don't (Oct. 2001)
Marcia Mardis, MILS
Discover how to access some of the Web's most valuable content in this new Digest. Recent studies estimate the size of the hidden Web to be about 500 times larger than the size of the known "surface" Web accessible through search engines, such as Google. The author, a former K-12 media specialist, is program coordinator and Internet media specialist at the Center to Support Technology in Education at Merit Network Inc. She presents on Web searching issues at conferences around the country and writes frequently on K-12 use of the Internet.

Uncovering the Hidden Web, Part II:
Resources for Your Classroom (Oct. 2001)
Marcia Mardis, MILS
How does an educator make practical use of the wealth of information available on the hidden Web and make it accessible to students? This Digest article will help teachers find key resources—for themselves and their students—and develop techniques for keeping track of the treasures they unearth on the hidden Web so that they can be accessed quickly and easily every time. Topics include accessing clearinghouses, virtual libraries, full-text resources, and learning objects for classroom use.

Libraries in Today's Digital Age:
The Copyright Controversy (Oct. 2001)
By Carrie Russell
Copyright law and its adaptability in the digital environment continue to be fraught with uncertainty. This Digest, written by the copyright specialist for the American Library Association's Office for Information Technology Policy, provides an overview of the continuing ambiguities libraries and their users face in dealing with copyright in today's digital environment. Issues addressed range from the practical, such as collection development, licenses, and preservation, to the philosophical and legal.

Proof of the Power:
Recent Research on the Impact of School Library Media Programs on the Academic Achievement of U.S. Public School Studies (Oct. 2001)
By Keith Curry Lance, PhD
This Digest provides a summary of four recent, major statewide studies (of Alaska, Pennsylvania, Colorado, and Oregon). Completed as recently as mid 2001, these studies were conducted by researchers affiliated with the Library Research Service of the Colorado State Library and the University of Denver. Written by the director of the Library Research Service, who published groundbreaking research in 1993 that also made a compelling link between school library media centers and academic achievement, this article includes recommendations for action by school officials.

Successful K-12 Technology Planning:

Ten Essential Elements (Oct. 2001)
By Harvey Barnett
Administrators and others charged with creating a plan for using technology effectively in their school or district will receive helpful advice from an authority in this new ERIC Digest. The author, Harvey Barnett, currently Senior Research Associate in the Technology in Education program at WestEd, has served as a consultant to state departments of education for technology planning and policy issues. He has also served as principal of one of the first Apple Classroom of Tomorrow (ACOT) project schools in partnership with Apple Computer Inc. and as director of technology for the same district, Cupertino, in California.

COMING SOON

Trends and Issues in Digital Reference (forthcoming Nov. 2001)
By Abby Kasowitz

The NSF National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) Program: Opportunities and Challenges for Teachers and Librarians (forthcoming Nov. 2001)
By Lee Zia

How Small Public Libraries Can Act and Serve Like Big Ones (forthcoming Dec. 2001)
By Norm Perry

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The project directors of all seven of the educational technology programs that were designated as exemplary or promising by the U.S. Department of Education's Educational Technology Expert Panel have written articles for this special issue of *ERIC/IT Update*. Here they share lessons learned, challenges and pitfalls overcome, surprises encountered and questions that remain, while developing and implementing some of the most innovative, successful, and widespread educational technology programs in the country.

Education reform, technology as a tool, strong learning gains and new motivation, project-based learning, vision, and constructivism are a few of the words repeated throughout these articles. Policy makers, instructional designers, professors, researchers, school administrators, teachers, librarians, and parents—everyone interested in or involved with the education of our nation's children—will be interested in what they have to say. These exciting articles include links to project Web sites and the full text of dozens of research papers and reports that resulted from these programs.

The Challenge 2000 Multimedia Project: Fostering Project-Based Learning with Multimedia
By Michael Simkins

> "For most of these teachers, multimedia was a new technology, and many had only passing experience with project-based learning. What they shared at the outset was an interest in learning more about technology and a desire to provide the best education possible for their students…Through trial and error, exasperation, elation, and reflection, they shaped our concept of exemplary PBL+MM [project-based learning supported by multimedia] and what it takes to make it happen in the classroom."

The WEB Project: Technology Innovation in Rural Vermont
By Fern Tavalin

> "Very few participants in WEB Project initiatives have been blind supporters of technology. Being on the cutting edge meant that the industry itself was asking some of the very same questions that we were."

Generation www.Y: Students as Change Agents
By Dennis Harper

> "Rather than teaching technology skills to teachers and hoping they will use these skills to improve their students' learning, Generation www.Y trains students to form working partnerships with teachers in order to improve teaching and learning in their schools."

Smiling While Guiding Thirty Sixth Graders through Internet-Based Curricula when the Internet Is Down (and Other Lessons Learned with One Sky, Many Voices Projects)
By Nancy Butler Songer and Scott McDonald

> "One of the clear lessons from our work is that curricular programs can not be 'scaled' in the sense of providing cookie-cutter curriculum that researchers feel must be implemented in a particular way in a wide variety of school settings."

Technology in the Mathematics Classroom: Guidelines from the Field
By Shelley Goldman

> "MMAP [Middle-school Mathematics through Applications Project] was one of the first projects in math education to simultaneously unite reforms in comprehensive curriculum and technology development...We wanted to learn if it was feasible for technology to become a long-term partner in making the core math curriculum concepts and skills accessible to students. If it was feasible, we wanted to identify what issues stood in the way of universal adoption."

Modeling Instruction in High School Physics
By James Hathaway and Shayna Nardi, with David Hestenes and Jane Jackson

> "Although infusion of technology into the classroom is a key component of this program, it is secondary to pedagogical reform. The project goals are fully aligned with the National Science Education Standards. The Modeling method corrects many weaknesses of the traditional lecture-demonstration method, including fragmentation of knowledge, student passivity, and persistence of naïve beliefs by students about the physical world."

The Maryland Virtual High School CoreModels Project: Harnessing Computer Modeling for Scientific Inquiry
By Mary Ellen Verona and Susan Ragan

> "As a result of working with computer models, teachers are asking students different questions that require the analysis of more complex situations."

ERIC/IT UPDATE, covering the fields of library and information science and educational technology, is published exclusively online at www.ericit.org two to three times a year by the ERIC Clearinghouse on Information & Technology.

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The Challenge 2000 Multimedia Project: Fostering Project-Based Learning with Multimedia

By
Michael Simkins

In 1995, the Silicon Valley Challenge 2000 Multimedia Project—or the Multimedia Project, for short—was launched as one of the original nineteen Technology Innovation Challenge Grants funded by the U.S. Department of Education. The purpose of these grants was to support innovative applications of information and computer technologies to systemic educational reform. The grants provided substantial funding over a five-year period to school districts—in partnership with businesses, community organizations, and educational researchers—to implement, evaluate, and document cutting-edge ideas.

In the case of the Multimedia Project, our goal was to infuse the classrooms of Silicon Valley with an exemplary model of project-based learning supported by multimedia (PBL+MM). What did we mean by that? We defined PBL+MM as "a method of teaching in which students acquire new knowledge and skills in the course of designing, planning, and producing a multimedia product." And we said that "exemplary" PBL+MM would embody seven key dimensions: core curriculum, real world connection, extended time frame, student decision making, collaboration, systematic assessment, and use of multimedia as a tool.

Accomplishing the project's goal required the combined efforts of many people playing complementary roles. The core work was done by a group of classroom teachers that grew in number to over 150 and represented 50 schools in eleven school districts spanning the 1,740 square-mile Silicon Valley region. For most of these teachers, multimedia was a new technology, and many had only passing experience with project-based learning. What they shared at the outset was an interest in learning more about technology and a desire to provide the best education possible for their students. As members of what came to be called the project cadre, these teachers attended summer institutes and monthly workshops. They participated in on-line discussions. They used and contributed to the project's Web site. They developed new relationships with colleagues from other schools and districts with whom they formed a strong community of practice. Through trial and error, exasperation, elation, and reflection, they shaped our concept of exemplary PBL+MM and what it takes to make it happen in the classroom.

Supporting cadre teachers was a special set of individuals who served in the role of Technology Learning Coordinator (TLC). These were experienced classroom teachers who were "early adopters" of technology and had become skilled technology users. Each TLC had responsibility for a "team" of four to six cadre members. Grant funds were used to release TLC's from some of their classroom teaching responsibilities, which enabled them to provide their cadre members with on-site coaching and support, organize and lead local workshops, and coordinate their team's participation in annual exhibitions of student work and other project-wide activities.

Several organizations made significant contributions to the Project. Researchers and theorists from the Institute for Research on Learning (IRL) and SRI International, both in Menlo Park, California, helped develop the Project's initial plan and provided

a range of consultative services throughout the course of the Project. Joint Venture: Silicon Valley Network, a non-profit regional organization comprised of leaders from business, education, and government, provided an institutional "umbrella" that facilitated the necessary collaboration among schools and districts in the many different cities and communities that comprise Silicon Valley. San Mateo and Santa Clara County Offices of Education helped in many ways, such as providing fiscal oversight, meeting facilities, and help with integrating project activities with other professional development programs already underway.

The success of the Multimedia Project earned it recognition in September 2000 as one of only two educational technology programs nationwide to be cited as "exemplary" by the Education Department's Educational Technology Expert Panel. Mandated by the Educational Research, Development and Improvement Act of 1994, the eighteen-member panel was composed of educational practitioners, researchers, school reformers, evaluators, and representatives from local education agencies, institutes of higher education, businesses, foundations, and state and federal agencies. Its charge from Congress was to identify exemplary and promising programs based on four criteria: quality of program, educational significance, evidence of effectiveness, and usefulness to others.

Elements of Success

What accounts for the Multimedia Project's success? No one thing, of course, but I believe the following three factors worked very much in our favor:

1. **Focus**
   Our project had one single, clear goal. We knew what we were trying to do, and we managed to keep from getting sidetracked. A turning point was the creation of the Multimedia Project Rubric, which provided a concrete description of what an exemplary multimedia project looked like. Once we had the rubric, we knew we weren't just headed north or south but to a specific set of coordinates.

2. **Support**
   The teachers in the Multimedia Project were not just dunked in a training vat and sent back to their classrooms to practice their new skills. Certainly, we had workshops and institutes, but we also systematically developed a community of practice in which we all supported one another. The Technology Learning Coordinators were a critical component of this community, and their ability to provide on-site mentoring was crucial to our success.

3. **Accountability**
   We developed tools of accountability, and we used them. In order to access their mini-grants, teachers had to develop sound proposals for how they would implement PBL+MM in their classrooms. Before being paid their modest stipends, they had to supply evidence of what their students accomplished. Each spring, we used the Multimedia Project Rubric to score a sample of student projects, and we set annual improvement goals based on the scores obtained. We held annual exhibitions where students' work was showcased for their peers, parents and the public.

Lessons Learned

What lessons did we learn? Three stand out. First, doing really good PBL+MM is extremely difficult! To be successful requires a lot of teachers. They need to know their curriculum backwards and forwards if they are to design units that are really appropriate for project-based learning. A teacher working with a new subject or grade level will have a very difficult time knowing just where the "perfect project" lies. Teachers need to be in touch with their students' lives in order to find the right way to forge the connection between schoolwork and the real world. They need confidence in themselves and tolerance for ambiguity. They need the willingness to let the reins out and the judgment to know when they're out far enough. Perhaps most important,

they need patience and a sense of humor.

Second, success depends on good time management. Time is every teacher's nemesis. It's a scarce and precious resource with many demands upon it. Teachers have barely enough time to maintain their "teaching status quo" let alone embark upon major new learning and restructuring of their teaching approach. Not unlike major construction projects, PBL+MM units always seem to take longer than planned. The most successful of our teachers were the ones who planned their use of time carefully and scaled projects back to realistic proportions.

Finally, with the right combination of training, support, rewards, and accountability, teachers can make dramatic changes in their teaching practice and students can benefit from enriched educational experiences. Over time, teachers in the Multimedia Project were more likely than their non-project colleagues to take on the role of facilitator or coach, support student discussion of ideas, and encourage students to solve problems on their own. Multimedia Project students were more likely than their peers in other classrooms to engage in long-term activities, participate in small-group discussions, and actively seek solutions to problems of design. In all ways, Multimedia Project classrooms evolved in the direction of the constructivist teaching philosophy that underpins the PBL+MM model.

What Next?

We're very much looking forward to extending the PBL+MM community to teachers from across the nation, as well as throughout the world. We have developed a suite of products to help interested teachers and teacher educators learn about PBL+MM and join one another in doing projects and sharing experiences:

- **CD-ROM**
  Our CD-ROM, now available, is filled with additional resources for K-12 teachers who want to use PBL+MM in their classrooms. It includes video stories of classroom multimedia projects, resources for topics from assessment to multimedia, planning tools, project ideas, student handouts, rubrics, and more.

- **Videotape**
  Multimedia: A Sneak Preview is a videotape specially designed for classroom teachers to show to students when they first embark on Project-Based Learning with Multimedia (PBL+MM). It also serves as a quick overview of the PBL+MM teaching approach for parents, administrators, and community members.

- **Guidebook**
  Due to be published next summer, our teacher guidebook balances the words of researchers and project staff with advice from teachers in the field. The teacher-friendly handbook includes chapters on planning, collaboration, assessment, and new roles for teachers and students.

- **Web site**
  The PBL+MM Web site holds a wide range of resources. Teachers will find classroom activities, sample projects, and assessment tools, as well as tools for sharing projects and communicating with other teachers involved in PBL+MM. Staff developers will find background information on the theory and philosophy of the approach as well as materials to use in professional development workshops and seminars. Researchers and policy makers will find research data and evaluation reports.

In closing, I'd like to share one concern I have about the future. In California, at least, the current preoccupation—if not obsession—with "teaching to the standards" and raising scores on norm referenced tests is already causing some of our most stalwart PBL+MM teachers to question whether multimedia projects are a good idea. Even knowing their value, they question whether they can afford time for projects if it

means less time for drill and practice and covering material. For someone who has been in education for 30 years, this is disheartening.

Much of the time, we in education hang on the pendulum while it swings back and forth. One year, we're told to divide kids into three reading groups, teach them phonics, and insist that they look up every word in the dictionary before they're allowed to write it on paper. The next year, we're to immerse them in literature they can't begin to read, on the assumption they will somehow absorb it, and lock up the dictionary while we encourage students to invent their own spelling. Fortunately, there are many teachers who recognize the folly of this either-or approach and quietly seek a balance, as Harvey Barnett likes to say, *between instruction and construction*. As we witness a generation of teachers retire from the classroom, I can only hope that the fresh young people who are called to teaching will have similar good sense.

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The WEB Project: Technology Innovation in Rural Vermont

By
Fern Tavalin

Remember back to 1994 when AOL had barely 250,000 members and Apple was boasting about a new power computer that blazed at the incredible speed of 66 mhz. Then imagine an innovative technology proposal to the U.S. Department of Education entitled, "The WEB Project: Creating a Web of Evidence," that referred to a spider's web and not the World Wide Web. These scenes illustrate the naiveté with which most of our nation approached what was about to become a major revolution in communication--advanced and adopted faster than any innovation preceding it.

The combination of educational desires and industry-based, fast paced product improvement would quickly drive the WEB Project's vision away from the spider and into the net of the World Wide Web. Remembering the original, organic symbol of the spider, though, would bring us back to reality many times when the technology itself became too distracting or too virtual.

Our initial vision, maintained throughout the five-year federal innovation grant, was to use new multimedia and telecommunication tools to demonstrate student learning of complex performances and to engage students, teachers, scholars, and artists in conversations about work-in-progress. From the outset, our goals were based in educational outcomes for students. We selected the arts, humanities, and social sciences as areas of focus because they were extremely underfunded and underrepresented in the field of educational technology.

This article will relay a journey that has, through reflection, been described using models and structures. The actual development of the WEB Project was based on a belief that looking at work (student performance, educational practice, innovative ideas) collaboratively would lead to positive results for kids. With this as the backbone, we kept our eyes and ears open and explored what this might look like. (See the rubrics and student work samples.) In the spirit of the arts and humanities, we mixed intuition and systematic observation to learn what to do next. We firmly believed that technology would be a crucial tool to get us to our vision. (See action research.)

Building from Prior Experience

The WEB Project ideas stemmed from several initiatives that pre-dated its establishment, and some very simple field-tests occurred before a proposal for funding was submitted. Most importantly, I had just spent three years working on the Assessment Team at the Vermont Department of Education (VDE), coordinating an arts assessment initiative. The VDE was instituting student portfolio assessments in math and writing across the state. The statewide spotlight on the discussion of student work created a receptive audience for our basic concept--maintaining collaborative conversations about work-in-progress. The Paul Foundation was willing to take a risk in early 1994 and funded the purchase of three Power Macs so that I could work with art teachers in two schools to build digital art portfolios. Through a distance learning grant, the Vermont state legislature also funded equipment purchases for a small network of music teachers to experiment with music composition in their classrooms and exchange them on-line.

Although digital portfolio systems did not develop in the original test sites, the trials were successful in that they provided concrete knowledge about the essential elements of working with multimedia in a school context. The early exchanges in music composition pointed toward design and interface improvements that enhanced the WEB Project telecommunications components.

Taking the risk of trying something that may or may not work is financially prohibitive at the individual school level, especially in poor rural and urban districts. Rural areas are also limited by a lack of experience with "cutting edge" scientific and technological advancements. When the original idea of the WEB Project was presented to some of the most forward-thinking educational leaders in our state, the response was, "What you want to do is fifty years away." For these reasons, federal support for our project was critical at the outset so that we could establish a proof of concept.

Having access to resources at a national level provided us with technical knowledge and gave us the visionary support to believe that what we were dreaming could actually come true. From these national connections, we discovered similar projects in other areas of the country. In particular, sharing with the Challenge 2000 Multimedia Project in California and the Electronic Learning Marketplace in Maine enriched our own growth.

As conceived, the WEB Project was a statewide initiative with two centers of focus, twelve individual schools and several content-based networks of teachers in schools whose communication would be based on projects developed by key statewide organizations in the arts, humanities, and social sciences. Support was to be provided by the WEB Project, community members, higher education, and students who knew how to use technology.

Mucking around While Keeping a Watchful Eye

Internal research and external evaluation formed the structured learning components of the WEB Project, counterbalanced by attention to personal expression and collaborative production. After two years, we recognized three phases of questioning that have become helpful in guiding the success of subsequent ventures.

Phase One: How Do I Do This?

Along with the notion of "new" is the notion of "how." With inexperienced users, the "how" concerns technology. Once basic-level technology skills have been acquired, the "how" concerns appropriate pedagogy. In the case of innovation, "How do I do this?" is equally germane to project design, classroom implementation, and evaluation.

Our first training session with schools was very carefully planned and based on two years of prior experimentation. We articulated a progression from basic to advanced and planned to use an associated rubric as a tool to establish a baseline and measure progress. I had spent two weeks in San Francisco at the Center for Electronic Art working on a design team to build the first Web site for the Oakland Zoo. This gave me both a technical background and a sense of how professionals go about using multimedia technology. Upon return to Vermont, a multimedia artist and I planned the first workshop. In a friendly "get-to-know-you" opening session, we discovered that no one in our group had ever used a computer. Suddenly, we did not need to administer an assessment tool to establish the baseline. Indeed, no one understood the terms we had used as descriptors. This crash course in reality brought project planning back to the ground floor, perhaps even into the basement. While we did not revise our vision, we certainly changed the approach! Our answer to "How do we do this?" became very different from what we had been originally conceived.

Phase Two: Is This Worth Pursuing Further?

To adopt an innovation is a giant leap. Doing something new takes time and a natural question ensues, "Is the time spent worth the outcome?" In this phase, potential adopters examine the innovation to decide how it can be made better or whether it should be discarded.

An on-line literature exchange illustrates Phase Two very well. Teachers interested in strengthening student comprehension and reflective reading joined the Vermont Center for the Book and the WEB Project in a venture to figure out how to use telecommunication to meet this goal. An initiative called *Taking a Stand* was conceived as a way to foster in-depth on-line book discussions between students (grades 5-8) from different schools, while the adults looked on and used the student discourse as a reference for their own discussions about the merits of the project. After figuring the "how to" in the first year, project directors and three designated teacher-researchers decided that *Taking a Stand* was worth pursuing, but needed further research to determine whether on-line discourse was helpful. A range of variables was listed as contributing to or impeding the goals of the project. Most significantly, the participant-researchers thought that using a uniform approach to discourse would reduce some of the complicating variables so that we could look at on-line discourse rather than professional practice in general. Phase Two discussions recommended further pursuit with a guarded view about usefulness of the on-line process. A plan for professional practice and an accompanying research design was developed so that we could base subsequent decisions on concrete data.

Phase Three: What Are My Students Learning?

While this question is at the heart of instruction during all phases of well-conceived innovation in education, measurements of student performance cannot be reliably reported for several years. This is not to say that students shouldn't be assessed, it means that the results of the assessments are as much a function of the teacher's learning curve as they are of the student's ability to perform.

We organized assessment of student learning on many levels. Professionals in the arts, humanities, and social sciences joined in collaborative inquiry with teachers to build a notion of quality in the areas of historical research, multimedia production, reflection and critique, digital imaging, and reflective reading. Standards-based discussions about student work led to rubrics and exemplars that are currently on-line. The discussions also challenged whether the standards themselves were helpful. Teachers engaged students in conversation about work and several on-line conferencing systems were designed to foster collaborative discourse about student work-in-progress in the arts and literature. RMC Research Corporation also conducted an evaluation of the WEB Project that examined student learning based on a conceptual framework adapted from R. J. Sternberg's notion that "abilities are forms of developing expertise." At the school level, teachers built their own classroom assessments, with varying degrees of success.

In addition to collaborative assessment and project evaluation, teachers served as action researchers. The action research focused on critical project-wide issues such as:

1. Does critique of work-in-progress make a difference?
2. How can I document student problem solving in animation?
3. What are the benefits to reflective thinking in student on-line discourse?
4. How can we improve the professional development offered to the music composition network?

Technology as Tool and Terror

Very few participants in WEB Project initiatives have been blind supporters of technology. Being on the cutting edge meant that the industry itself was asking some of the very same questions that we were. As a result, many of the early products we

used were released for sale in what might have been considered "alpha" phase; the programmers were asking themselves, "How do we do this?" We, the early users, gave error reports and the programmers then fixed the problems in upgrades or issued completely new versions. This meant that users had to be adept at determining whether a problem was a user error, a software bug, or hardware defect. Imagine the resulting anxiety to new and reluctant users, not to mention project level frustration over constant problem solving and continuous expenditures to improve software. Indeed, some of the companies whose software we adopted decided to go out of business after they segued into the "Is this worth doing?" phase.

Constant change and a climate with an unknown future forced us to re-examine our strategies once again. With so much re-tooling, it was easy to accept that our project was not about teaching software; it was about using technology as a tool. We knew and believed this going into the venture, but forgot once we began the journey. I mention this because it is easy to get lost in a computer morass. We have done this at a national level with the technology standards for all teachers. The articulated list is more relevant to what technology teachers should know than to what all teachers should know. The "all teachers" list can be shortened to two standards: (1) All teachers should understand and use tools of technology that enhance a student's ability to learn concepts and acquire knowledge in a given area; and (2) all teachers should understand and use tools of technology that aid in communication with colleagues, parents, and other identified audiences. Simple standards like these re-emphasize the purpose of using technology as a tool.

Once we remembered that our project was about learning and not about technology, we began to limit the tool sets we used. In turn, it became easier to focus on the essential pieces and to abandon "eye candy" and unnecessary functionality. Equipped with a notion of assigning "tool sets for all teachers who wish to _____" our professional development offerings changed radically. We no longer taught directly to software, we structured project-based learning environments and identified key concepts, germane to the educational goal at-hand, regardless of the software selected. To reinforce this, multimedia professionals at our summer institutes were asked to use unfamiliar software. In that way, teachers also learned how to learn and saw other professionals doing the same.

An Example of Limited Tool Set--In November 2001, two representatives from the WEB Project traveled to El Salvador to begin a planning phase for what will eventually become an exchange with a youth radio group at Radio Victoria. We provided training in the use of digital video editing so that we can share files. The limited tool set comprised three items: digitizing, assembling, and printing to tape. This is something that can easily be taught and reinforced in one day, leaving a week to fully engage with essential discipline-based concepts like: audience, message, and point-of-view. Anyone with a fascination for transitions or special effects has gained a conceptual background from the introductory workshop and can acquire these additional computer skills independently.

On-line Collaborative Inquiry

Looking together at student work, professional practice, or new information requires structure, flexibility, and facilitation. When collaborative conversations go on-line, there are actually two facilitators: the people involved in the discussion and the technological interface. Human interactions have to be exaggerated and formalized on-line because there is no natural reminder to listen, respond, and reply. Moreover, very few conferencing systems build interfaces that reflect the shift in thinking from teacher as knowledge-conveyer to teacher as facilitator. Threaded discussion interfaces that allow a user to see a conversation in its entirety, instead of clicking through individual posts, reinforces the concept of collaboration. Allaire Forums is the shareware conferencing system that the WEB Project selected to use and modify because it builds from an interface that allows users to see the conversation as a whole, shifting the discussion focus from "tell the teacher" to "talk with each other."

As our work progressed, we identified three different types of conversations whose

interfaces, protocols, and purposes differ distinctly: design conversations, on-line dialog, and information exchange. Once articulated, being conscious about whether an interaction is based in creating, discussing, or exchanging, guides the planning and implementation of initiatives.

Design conversations focus on creating something new, such as a piece of music, artwork, a survey instrument, the plans for a multimedia production, and so on. Collaborative discussion gives the creator a chance to receive multiple insights while the shared focus on a single piece of work broadens learning for the entire group. When conflicting viewpoints are represented, it also provides an opportunity for the creator to make informed decisions based on personal intent. A collaborative design discussion often leads to results that would have otherwise been unimagined.

On-line dialog can be helpful to use when planning an event, analyzing data, discussing points of view, or troubleshooting. When specific goals require on-line discourse to be focused and timely, then establishing protocol-based discussions with specific rules moves the conversation along. There are also times when free-flow conversations about ideas continue at a leisurely pace due to the asynchronous nature of threaded discussions. In such cases, loose guidelines for free-flow conversation enhance the discourse.

There are times when our on-line discussion has been based in an *information exchange*, the need or desire to learn from primary source information of a contemporary or historic nature. Such an exchange provides the opportunity to share a local collection of skills, resources, or knowledge with others who do not have the opportunity to experience this first-hand. Information exchanges have worked best for WEB Project initiatives when they are short lived, focused and lead to the publication of something like a joint Web site. Multimedia files (images, audio, or short video clips) greatly enhance an information exchange.

Lessons Learned and Future Plans

The arts and literature components, the first models from our original work, have taken on lives of their own. They are presently self-sufficient and have a solid theoretical and practical base from which to improve. The history and social sciences portion of the work remains unfinished, but shows promise.

Thanks to the evaluation of our larger effort, we have established a set of conditions necessary for further development and success:

1. Establishment of a concrete, meaningful project that everyone can understand and is excited to participate in.
2. Discussions amongst community members, educators, students, and content experts that focus on work and improvement of work associated with the project.
3. Links to local, regional, state, and national agendas to create conditions that can lead to sustainability.
4. Continuing dialog with other groups trying similar ideas.
5. Plans that contain multiple layers of success (the project itself is worthwhile, has the potential to bring a community together, and can lead to larger ideas and models of thinking).

These conditions translate to our current projects, including:

Applied Learning Studios: By August 2002 we will publish a curriculum for the development of communication and problems solving skills in community-based learning environments for students in grades 7-12.

Putney Celebration 2003: Five schools, several community organizations, and many individual citizens from the town of Putney will collect oral histories and assemble artifacts that represent the last 50 years. These primary materials will be used to update the town history, prepare digital information, and present works of art and

theater.

Radio Victoria/El Salvadoran Youth Radio: In November 2001, the WEB Project began Phase I of a partnership with youth in El Salvador who have created community radio stations. Presently, we are sharing information about digital video editing so that they can demonstrate their stations in action to potential sponsors. Eventually, we hope to explore Internet radio applications together.

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Generation www.Y: Students as Change Agents

By
Dennis Harper

Generation www.Y (GenY) is a program that uses partnerships between students and teachers to integrate modern computer technologies into the classroom. The program promotes the effective use of educational technology in schools, develops opportunities for student leadership, and fosters a collaborative, learning community atmosphere in schools. Rather than teaching technology skills to teachers and hoping they will use these skills to improve their students' learning, Generation www.Y trains students to form working partnerships with teachers in order to improve teaching and learning in their schools. Students become agents of change, assuming responsibility for helping to improve the educational resources available to themselves and their classmates.

Generation www.Y students learn technology skills with an emphasis on applying these skills to a real-world problem: helping teachers use technology to deliver more effective lessons. Students and partner teachers learn how telecommunications tools, the Internet, digital imaging and presentation tools, and other technologies can enhance lesson plans and curriculum units. Many Generation www.Y students and partner teachers also learn about their state academic standards and learning goals, and the process of aligning classroom activities with these goals.

Each Generation www.Y student is paired with a partner teacher (or an administrator, librarian, counselor or other educator), who decides what lesson plan, curriculum unit, or other school need will be addressed by a collaborative, technology-enriched curriculum project, which the partner teacher and the Generation www.Y student produce together. These projects are then used in the partner teacher's regular classroom, or in the library, administrative offices, etc. Through this model, participating educators receive individualized support as they strengthen their use and integration of new technologies. Students learn technology, communication, collaboration, and project management skills in an authentic, personally meaningful context, and many go on to further extend their skills through advanced school or community service projects.

The program was developed in the Olympia, Washington School District, with a five-year award in 1996 from the U.S. Department of Education's Technology Innovation Challenge Grant program. Numerous state and local grants as well as corporate sponsorships have also supported the development of the instructional model and materials, as well as dissemination of the model to schools outside Olympia. Generation www.Y classes have operated in over 500 schools in 42 states. The program provides a model that can be customized to fit a wide range of grade levels, technology infrastructures, scheduling requirements, interests, and skill levels of participants.

Data from the nationwide project indicate that the program can be an effective alternative for schools wishing to integrate technology into their regular curriculum and increase their use of project-based, student-centered learning practices. The model provides individualized support for educators who wish to increase their use of technology without becoming distracted from the essence of their jobs--building and delivering effective curriculum units and lesson plans. Generation www.Y achieves

this by giving students experience with educational technology, communication skills, and information literacy, then allowing students to act as responsible partners with their teachers in building new curriculum materials and new teaching and learning practices.

A five-year independent evaluation of Generation www.Y has been conducted by the Evaluation Program of the Northwest Regional Educational Laboratory (NWREL). Each semester since the beginning of the program, NWREL researchers administered surveys to all participating students, Generation www.Y teachers, and Generation www.Y partner teachers, as well as analyzing the collaborative projects produced by partner teachers and students. At selected schools, additional research was conducted, including observations, in-depth interviews with participants, and additional surveys of all faculty members (participants and non-participants). Teachers were asked about their beliefs and practices regarding teaching, learning, educational technology, and the transformation of schools into learning communities, in which students and teachers are enthusiastic partners in learning.

Two major sets of findings have emerged from this research. As intended, the Generation www.Y model has been successfully adapted to a wide range of school contexts. The program can be implemented in schools with different grade spans, technology infrastructures, curriculum and instruction frameworks, and community contexts. Generation www.Y can be tailored to support a wide range of other educational technology initiatives or curriculum projects. However, implementing the model successfully requires a high level of commitment from school administrators, as well as significant time, energy, and creativity from a dedicated Generation www.Y teacher. In general, when the model doesn't work in a school, it is because of a failure to fully implement the program.

In schools with full implementation of the model, both teachers and students report very positive outcomes. Participating teachers receive effective, individualized support as they integrate new technologies into their work. Students learn technology, communication, collaboration, and project management skills in an authentic, meaningful context, while producing something of value that becomes a learning resource for others in their school.

Six schools were selected as case study sites for supplemental interviews, surveys, and observations. Also presented is data from a series of interviews and observations with Generation www.Y teachers who have delivered the technology integration model over the course of several years, and who provide insight into the evolution of the model and the long-term impact of the program in their schools. The report also contains a statistical comparison of professional development gains in a sample of Generation www.Y partner teachers and their colleagues who did not participate in the program.

Participating teachers and students report that their involvement in Generation www.Y afforded them an excellent opportunity to improve their basic technology skills as well as their more advanced abilities to integrate technology in standards-based lessons, projects and curriculum units. Both teachers and students report that they gained meaningful, authentic experience developing skills in technology use, collaboration, project management, and information literacy, while contributing to the improvement of their schools. Most found the Generation www.Y model to be an effective professional development strategy for teachers as well as an effective approach to increasing student engagement, student learning, and student leadership.

Useful information regarding facilitating conditions, challenges, and keys to success emerged from this study, which should be provided to schools interested in implementing Generation www.Y. This information can help schools determine if the program is a good match for their needs, as well as give them information about how to prepare and develop a successful Generation www.Y program. A number of other challenges and recommendations are highlighted in the report.

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Feature Articles

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Smiling While Guiding Thirty Sixth Graders through Internet-Based Curricula When the Internet Is Down (And Other Lessons Learned with One Sky, Many Voices Projects)

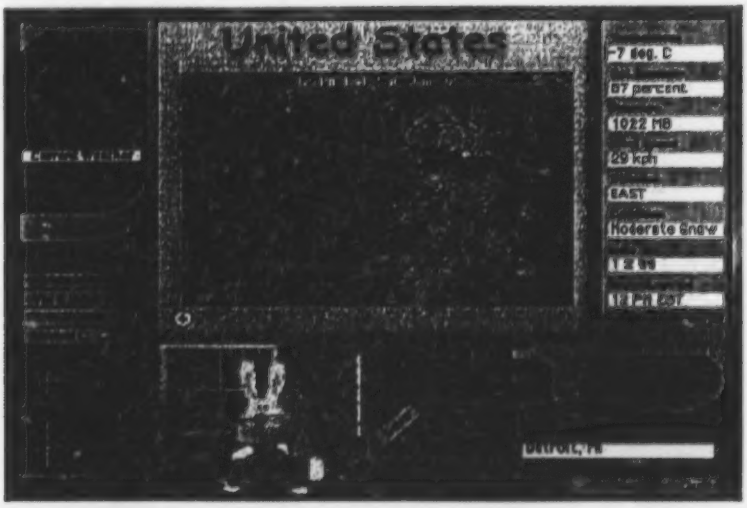
By
Nancy Butler Songer and Scott McDonald

For several years, the *One Sky, Many Voices* (OSMV) education and science group at the University of Michigan has developed, researched, and learned from technology-rich inquiry science programs adapted to thousands of classrooms across the country. One of our goals is to create innovative, inquiry-based science programs that utilize current technologies such as CD-ROMs and the World Wide Web for the interactive study of current science. Our work to support thousands of students, teachers, and scientists as they forecast current storms or predict landfall for live hurricanes off the coast of Florida is extremely challenging. Nevertheless, our research results demonstrate strong learning gains and new motivation to learn science among a wide range of middle school students as a result of participation in our programs. Importantly, we have also learned several important lessons on how to design and support Internet-based curricula among thousands of simultaneous learners. Below we share four of these lessons learned, as well as our latest curricular program.

Lesson 1: The Internet-Based Programs Must be Far More Reliable Than the Internet Itself

One of the somewhat unique benefits of our program is that for our $20.00 classroom subscription fee, we provide Internet-capable CD-ROMs that retrieve current weather imagery from websites around the world, and place them in a kid-friendly interface that allows learners to customize the images as they wish, such as superimposing current radar over live satellite images as pictured below (see below). Our Web browser sits on this CD-ROM, and it allows learners to get whichever live images they need to answer their own questions about weather (as guided by our eight weeks of activities). Unlike traditional web browsers, our CD-ROM-based browser does not allow kids to check sports scores or the weather in Tampa, FL—only to retrieve weather imagery, thus keeping kids' attention focused more directly on the science activities at hand.

What happens when a teacher wants to guide her class through our activities to forecast live storms, and realizes her Internet connection is down? We quickly realized that we needed a good response to this issue if we were to entice many teachers to use our programs each year. Therefore, we added complete sets of imagery of archived storms on each CD-ROM. The archived storms look exactly like the live pictures, and allow students to work with all of our activities when the Internet is not available. This feature allows teachers to continue teaching our activities each day of the program, even when their Internet connection is down or unreliable. Good teaching cannot wait for the Internet to become a reliable resource every day of every academic year. Therefore, in order for classrooms to take advantage of Internet-available resources such as current weather imagery, we strongly recommend that other projects consider mechanisms to provide consistent educational resources for their programs so that good education can continue even when the Internet does not.



Lesson 2: Good Support Means Participants Supporting Each Other

"The lateral learning and discovery that accompanies the core program is incredible. And just perhaps that is all a part of the plan."--An OSMV teacher from New York

As a result of participation in the conversations on the OSMV teacher message boards, this teacher realized what he calls "lateral learning," meaning the tips on teaching that he learned from other teachers who had taught this program in previous years. Since the curriculum is subscription-based and implemented at the same time in all classrooms, message board conversations often focus on the lesson being taught that week, allowing teachers to feel more confident in their enactment even if they are enacting it for the very first time.

In our program we provide professional development and support to two loose categories of teachers: urban systemic teachers and mavericks. The urban systemic teachers are all from the local urban district that partners with OSMV for urban reform and professional development. The maverick teachers are from all across the country. They largely find us on their own and cannot be provided the same type of supports that can be provided to the local teachers in our partner district. Working on the professional development of teachers and support for both groups has been an on-going process.

Teachers participating in our programs are often stretching themselves to engage with content and teaching that they have not attempted before. Even those that have been participants for years encounter unique challenges to their teaching and ideas about learning with each new enactment. We have developed a variety of resources to support risk taking. More distant teachers utilize the teacher message board referred to earlier to learn from peers and scientists about today's weather, a message of the day from scientists built into the CD-ROM, and support within the curriculum materials themselves. In our local urban partner district, the OSMV team conducts workshops in the summer as well as on-going workshops and study groups prior to and during the enactment of the curriculum. For each teacher, we work to provide ongoing, responsive supports that help them find conversations, tips, and resources that smooth their individual teaching of our Internet-based programs.

Lesson 3: Promote Large Scale, Not Scaling

Scaling is a major thrust of educational reform initiatives; without broad impact in a large number of schools, reforms run the risk of making no lasting change on the educational landscape. One of the clear lessons from our work is that curricular programs can not be "scaled" in the sense of providing cookie-cutter curriculum that researchers feel must be implemented in a particular way in a wide variety of school settings. The resources and constraints that individual teachers encounter are

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diverse and cannot all lead to the same enactment. We obviously want our curriculum to be adopted by as many teachers as possible, but we do not prescribe, or even anticipate that they will all enact it in the same way. We build curricula that we fully expect will be adapted by teachers to their local classrooms. We think that this flexibility is one of the real strengths of our curricular programs.

Lesson 4: Teaching Inquiry Is Many Variations on a Theme

Our final lesson deals with the idea, or more correctly the ideal, of science inquiry. When people talk about inquiry there is an implication that there is a clear and somewhat monolithic idea of how this should look in classrooms. For example, there should be small groups of students engaged in a variety of more or less self-guided activities with the teacher moving from group to group acting as a resource and guide. While this is a nice image, it is not realistic within the constraints of some schools, so we believe that the definition of what inquiry looks like needs to be broadened. One example is our work to redefine what small group inquiry activities could look like in a class size of 35, as is common in urban schools in our region. (The bottom line answer is that inquiry can work very well without small groups). We need to develop multiple exemplars of inquiry, so that teachers in a variety of environments can have strong and successful models to follow. This approach can help a wide range of teachers to be effective as agents of successful inquiry without breaking themselves against an unattainable single model of the right way of doing things.

New Program: BioKIDS

We are currently developing a new curricular program, *BioKIDS: Kids Inquiry of Diverse Species*, built on the lessons from our earlier programs and extended into the area of biodiversity. BioKIDS gets students involved in collection of field data and construction of a local field guide for their area, but also gives them access to large data sets about species distribution and behavior so they can deeply explore inquiry into species interrelationships. Local data collection is done by students in the field with GPS capable handheld computers and CyberTracker ™ software that allows them to easily record animal sightings and later compiles them into a large class or even program-wide database. Students also use the Internet to build species accounts that describe their species in detail and can be linked to other students accounts from all over the country to create webs of relationships. The Animal Diversity Web™ at the University of Michigan provides access to professional level species accounts and also hosts the student-created accounts. Finally, Nature Mapping™ provides access to large biodiversity data sets and a simplified geographic information systems interface that allows students to do more in-depth inquiry as to how species relate to each other.

BioKIDS gives the OSMV team another opportunity to improve on our design and understanding of technology-rich inquiry science curriculum in the hopes that we can continue to meet the needs of as many science teachers around the country.

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Technology in the Mathematics Classroom: Guidelines from the Field

By
Shelley Goldman

The promise of using technology in mathematics classrooms to improve teaching and learning is especially bright. What a natural connection. Gathering data, analyzing it, looking for patterns, transacting among representations, developing algorithms, and thinking spatially are all greatly facilitated by computer use. These are some of the very activities that have been endorsed by the national mathematics standards (NCTM, 2000). Unfortunately, the promise of technology in school mathematics is largely unrealized. Many math classrooms have no computers, and in math classrooms where computers are present, they are used mainly for skill practice or as a supplement to the official math work.

Simply loading classrooms with technological devices won't improve learning; principled use of computers, software, multi-media, and Internet resources is needed. Through a decade of research and curriculum development with the Middle-school Mathematics through Applications Project (MMAP)[1], we delineated a set of guidelines for technology in the mathematics classroom. They are shared with the hope that they might contribute to realizing the promise that technology holds for enhancing math learning. MMAP was one of the first projects in math education to simultaneously unite reforms in comprehensive curriculum and technology development. We experimented with the ways middle school math could be made more powerful by coupling content activities with computer technology. The results thus far have yielded a comprehensive middle school curriculum as well as products such as published research papers, CDs and web resources for teachers.

The overarching goal of the project was the development of the technology-integrated, comprehensive curriculum. The centerpieces of the curriculum are design-based projects that draw on the integrated use of technology and provide plenty of opportunities for middle school mathematics to be made visible and used. The projects—designing a research center for Antarctic scientists, creating and breaking codes, helping to save guppies while their natural habitat is restored—offer opportunities for a set of standards-based math topics such as proportional reasoning and function to be introduced, explored, developed, and practiced. Traditional paper materials and computer technologies are bundled with guides for teachers to sequence lessons and activities. MMAP technology environments range from friendly, game-like simulations to more business-like spreadsheets, but they all support activities that meet middle school standards and are mathematically and pedagogically significant (Goldman & Moschkovich 1998a, 1998b; Greeno et. al. 1997,1998; Knudsen & Briskman in press).

In the Antarctica Project, for example, students design an Antarctic research station for a reasonable cost that can adequately house four scientists as they work and live for two years. The application, ArchiTech, was developed to provide students with a computer aided design (CAD) system for working on and analyzing features of the station design. Students use the software to create many different designs that meet the project constraints and to experiment with and improve their designs by making changes in available design parameters as well as by changing and analyzing the shape, size, and features of their plans. The project takes up the topics of

proportional reasoning and direct and inverse variation as well as providing review and practice opportunities in calculation, scale and measurement.

One of our goals was to develop technologies and research the roles they played in keeping more middle school students engaged in, and grappling with, mathematical processes and mathematical concepts. We saw an emerging body of complementary technology development addressing similar goals (e.g. JASPER, Function Probe, Geometer's Sketchpad, Earth Lab, AT&T Learning Network). Unfortunately, classroom practice with technology outside of those instances was not yet a sustained, integrated aspect of classroom practice. We wanted to learn if it was feasible for technology to become a long-term partner in making the core math curriculum concepts and skills accessible to students. If it was feasible, we wanted to identify what issues stood in the way of universal adoption.

Early in the development process we knew that technology was motivating to students and thought we could capitalize on that fact to keep them interested in school mathematics. Frankly, we understood little about that motivating aspect, but relied on it while expecting to learn more. After seven years of development and classroom research, we moved beyond that real, yet simplistic depiction of how technology was powerful for students because we had documented many instances when technology leveraged learning in significant ways. Technology not only brought students to the table to do their classroom work, it also engaged them deeply and over time with mathematical content and activities that they found sustaining and relevant.

As it turns out, technology is neither panacea nor glitzy new classroom toy. It should and, not surprisingly, does get used only when and where it is helpful and, indeed, helps achieve learning goals. We documented many manifestations of the power of technology. Simulation environments, for example, provided sophisticated tools and manipulators for students, allowing them to gain hands-on experiences that took them beyond blocks and tiles, and promoted experiences that anchored explorations and conversations that were steeped in key mathematical concepts. Students moved easily among mathematical representations such as visual maps, tables, charts, graphs and standard mathematical expressions. Technology facilitated students' efforts to generate, explore, discuss, and analyze data, which are all important goals in current mathematics teaching and learning (NCTM 2000).

The technology also provided a scaffold for moving students from concrete ways of thinking, operating and talking to abstract mathematical concepts, practices and language. It set the stage for students to make and test conjectures, find and analyze patterns and data, and draw conclusions. Finally, the technology made it easy to process large amounts of data, which freed teachers to use complex projects in the classroom without getting bogged down in excessive or inaccurate computation.

Guidelines for Technology in the Math Classroom

The intense, long-term research and development process we completed resulted in the identification and adoption of working guidelines for technology integration in mathematics classrooms. The MMAP design process was cyclical and comprised of generating ideas, prototyping, testing the application project ideas and software with small groups of middle school students, redesigning and then extensively field testing in classrooms. The research and development that led to the guidelines spanned thousands of hours of partnership with, and observations of, teachers and students at work with materials in their classrooms (Greeno, et.al. 1999). It also included six years of summer institutes and monthly meetings with a group of thirty-plus teachers where we debated the feasibility of, and tested, various combinations of application projects, classroom mathematics activities, and software functionality. What follows is a set of guidelines for successful integration of technologies in schools, particularly within mathematics. Although not exhaustive, these are the foundation from which we continue to explore, experiment with, and evaluate technology work.

1. Technology should be an integral part of learning and teaching and should

not be used as an add-on to the curriculum or simply for its own sake.

The use of computers and other pieces of technology in isolation from the core curriculum creates the needless separation of technology and important content. Computers need to be yet another tool that students have available for learning, as appropriate. Students and teachers will learn to use computers for solving problems when they are useful and integral parts of the curriculum, not separate and exotic add-ons.

By integrated, we mean that there should be a proper balance between the use of computer technologies and other resources and tools, and work with technology should bring you closer to the learning goals, not distract from them. It should not have an elevated status or dominate in terms of curriculum time. In MMAP, we designed the use of computers to weave tightly with learning goals and activities, and we estimated that students used computers only one-third of project time. In other classrooms, technologies should be used when they help students better understand or manage particular skills or concepts.

School learning is a social process, where teachers and students work together to explore, shape, refine, and make use of ideas. Thus, technologies should not be designed or chosen solely for the purposes of transferring information or practicing operations and skills. Instead, computer environments should foster easy representation, exploration, and public inspection, as well as easy modification of ideas, concepts and disciplinary practices. They should facilitate access by many to both individual and group activities and work.

2. Technologies should be designed, chosen, and used to support content area learning goals.

Important as it is, designing technologies with regard to social and cognitive aspects of learning is not enough; the special demand of teaching and learning a particular subject matter also needs to be considered. In mathematics education, we see several appropriate roles for computers:

1. As simulation environments, in which students can test conjectures or generate related cases to make conjectures and look for patterns.
2. As analytic tools, with which students can begin to describe relationships and patterns, arrange and manipulate tables and graphs, create formulas, and explore the relationships of these mathematical representations.
3. As communication tools, with which teachers and students can engage in questioning, reasoning, record keeping, sharing, discussing, and explaining the work they are doing.
4. As computational tools, with which students and teachers can operate on large or complex numbers, quantities, and values.

Computer environments for middle school should help students to focus their attention on math topics, such as scale and proportion, functions, geometric thinking, and logic. Within and across these topic areas, the technology should allow teachers and students to collect, organize, and operate on data; create and use mathematically meaningful representations; and create and test hypotheses. Computer environments should also make it easy to provide students with multiple representations of their activities. They should also make it easy and efficient for children to create and use visual representations, charts and spreadsheets, graphs, tables, and formulas.

3. Technologies as friends, not foes, of teachers.

Computers *must* make very obvious contributions to more successful learning if they are to be worth teachers' time and efforts to learn and to manage. Even when there is achievement gain to be realized, bringing computers into the classroom can be seen as, and can actually be, just another problem for already overworked and overburdened classroom teachers. Taking on teaching with technology is a huge job,

and it takes quite a bit of restructuring of the classroom experience.

Every teacher who used MMAP made substantive changes in the ways he or she approached classroom and curricular activities. Teachers planned differently, set up new physical spaces in the classroom, and innovated ways to move students through activities, space, and time. They thought about new approaches to mathematics content and new ways to assess mathematics learning. Restructuring their classrooms became a never-ending job. Integrating technology was not a trivial task to the teachers with respect to their workload, so it needed to be worth it on the learning results side of the equation. It had to make a difference in the quality of the mathematics experience for it to come to the top of teachers' priority lists.

4. The issue of inequitable access to computers can be addressed by proving the need for computers in the curricula.

The inequities associated with computer use in school are well documented. Some schools and classrooms have computers; many don't. If mathematics learning and teaching is enhanced by well-deployed and thoughtful use of computers, how can we start bringing these experiences to more students?

There are no simple answers. Yet, as curriculum developers and researchers, we feel a responsibility for responding to inequities. It is not enough to say we cannot use technology because of access issues. Instead we must demonstrate a compelling curricular need for computers and dispel the myth that computers are a luxurious, frivolous, or incidental add-on. When the value of computers was proven for improving workplaces, computers, software, and staff development followed. The same will be true of schools. When computers can be seen as contributing to improved success in core content areas, schools and teachers will make it a priority. With MMAP, teachers saw a greater number of students engaged, exploring, making conjectures and testing them out, debating how to proceed or how to analyze data, and generally becoming better problem-solvers. The impact potential was clear and they committed eagerly to new kinds of work.

In conclusion, to realize the promise of technology in the mathematics classroom, teachers need to see compelling demonstrations and results that make obvious a positive and indisputable impact on teaching and learning. The technologies developed must be targeted at meeting the social and learning needs of students. Technologies must not only be there, but they must be capable of engaging the students with meaningful content and in ways that support their connections to it. They must be in direct service of curricular and learning goals.

There is a price to pay financially and professionally as schools explore the potential of technology. Teachers must see that it advances their work if they are to make technology work a priority. Finally, and perhaps most importantly, technology integration will play a role in the school mathematics equity and access equation.

We have been able to document the ways in which technology has positive impact on the quality of the students' mathematical experiences. Knowing this, we need to find ways to create more access to, and staying power for, technology in standards-based classrooms. MMAP technology has helped us better understand the power of technology in the math learning enterprise. In that sense, it has provided a case study for what is possible.

Notes

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Feature Articles

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Modeling Instruction in High School Physics

By

James Hathaway and Shayna Nardi, with David Hestenes and Jane Jackson

Since physics is the foundation of all modern science and the source of most modern technological achievements, it is vitally important that it be taught effectively at all educational levels. Unfortunately, for many high school students, getting through physics class is a test of their ability to memorize facts, plug numbers into equations, and resist the temptation to snooze. But a teaching program developed in Arizona State University's Department of Physics and Astronomy is awakening student interest and achievement by making physics a dynamic subject. The program, called Modeling Instruction in High School Physics, earned the U. S. Department of Education's highest honor for its success in reforming the way high school physics is taught. In 2001 the U.S. Department of Education's Expert Panel on Mathematics and Science Education designated the Modeling Program as one of two exemplary science education programs, out of 27 programs submitted to the agency. In 2000, the Modeling Program was recognized by the U.S. Department of Education's Expert Panel on Educational Technology for its outstanding integration of technology into the classroom.

The Modeling Method of High School Physics Instruction has been under development at ASU for two decades under the leadership of David Hestenes, Research Professor of Physics. The program cultivates physics teachers as school experts on the use of technology in science teaching and encourages teacher-to-teacher training in science teaching methods, thereby providing schools and school districts with a valuable resource for broader reform.

With funding from the National Science Foundation and other sources, 200 leading high school physics teachers nationwide have learned Modeling Instruction, as well as half of the 230 physics teachers in Arizona.

The Modeling Method proved successful with students who have not traditionally done well in physics, while also enhancing the performance of all students. Experienced Arizona modelers report increased enrollments in physics classes, parental satisfaction, and enhanced achievement in college courses across the curriculum. Research papers, feedback from teachers on implementation in their schools, and extensive instructional materials can be downloaded. Also available at the Web site are a list of workshop sites and contact information on 200 teachers in 44 states who can lead Modeling Workshops in their region.

Modeling Instruction engages students with simple scenarios, such as the movement of a falling object, to learn to model the physical world. Instead of relying on lectures and textbooks, the Modeling Program emphasizes active student exploration of these models in an interactive learning community.

"The teaching method is based on models—that's the heart of it," says Jane Jackson, Co-Director of the program and former physics professor. "Unlike the traditional approach, in which students wade through an endless stream of seemingly unrelated topics, the Modeling Method organizes the course around a small number of scientific models, thus making the course coherent."

Another focus of the program is to teach students how to think and work for themselves. "It moves the emphasis from the teacher to the student," says Larry Dukerich, Dobson High School teacher, Co-Principal Investigator of the program and leader of teacher workshops. "I came to realize that teaching by telling is ineffective. I became involved in the program because I was dissatisfied with my teaching practices and was looking for a way to get students more actively engaged."

Classroom activities start with a demonstration by the teacher--of the swinging of a pendulum, for example--followed by a group brainstorming session in which the students identify factors that might influence the pendulum's motion. The students then work in small groups to develop models describing the motion and to evaluate their models by comparing them with data collected in experiments that they design. Students are required to present and justify their conclusions in oral and written form. Computers are used throughout the process as scientific tools, with groups of three students working at one computer workstation that includes a lab interface and sensors/probes.

"The greatest promise of computers is to augment and extend human powers to think," says Dr. Hestenes. "In Modeling Instruction, students learn to optimize the use of new tools, especially technological tools. Such skills help students become proficient and critical consumers of educational technology and prepare them for entering a technology-infused work place."

"Although infusion of technology into the classroom is a key component of this program, it is secondary to pedagogical reform," notes Dr. Jackson. "The project goals are fully aligned with the National Science Education Standards. The Modeling Method corrects many weaknesses of the traditional lecture-demonstration method, including fragmentation of knowledge, student passivity, and persistence of naive beliefs about the physical world."

Dr. Hestenes stresses that instruction centered around models provides "a conceptual structure with models as units of coherently organized knowledge. It is a framework that students can use to organize information about the physical world in many different situations." In this respect, the Modeling Method differs substantially from more typical "fact collecting" approaches to science teaching.

Hands-on student exploration of phenomena is also an integral feature of modeling because it makes what they've learned in the classroom more meaningful. "Instead of just presenting lectures, we involve students in activities that stimulate them to build the structure themselves, so that this becomes incorporated in the structure of their own thinking," says Dr. Hestenes.

Dr. Hestenes particularly emphasizes the value of student presentations, not only in understanding physics but also in lifelong learning. "We teach students to articulate what they've learned in a coherent way.... The aim of the program is to enable people to articulate their own views clearly and defend them with argument and evidence. In the process, they learn to interpret other people's claims and evaluate those claims." Dr. Jackson adds, "The bottom line is, we need a populace that can think. Modeling Instruction teaches students to think clearly and scientifically."

The Modeling Method has a proven track record of improving student learning. Data on some 20,000 students show that those who have been through the Modeling program typically learn twice as much as other students. Dr. Hestenes attributes much of the program's success to the fact that it explicitly addresses common student misconceptions about physical processes.

"Most students come into physics class with naive beliefs that they must overcome before they can truly understand the principles of physics. Standard physics instruction does not deal with students' views, so the students systematically misunderstand what is going on in class. Modeling Instruction addresses this problem expressly with the change in perspective that is necessary for understanding," Dr. Hestenes explains.

The Modeling program is implemented by traihing physics teachers during intensive summer workshops. Teachers who complete two three-week workshops are equipped to train other teachers in the Modeling Method. Workshops are held each summer at universities nationwide and at Arizona State University. Modeling Workshops at ASU are the cornerstone of ASU's new graduate program for teachers of the physical sciences. A Modeling Workshop for middle school mathematics and science teachers is offered also.

The Modeling Instruction Program has stimulated formation of the Arizona Science and Technology Education Partnership (AzSTEP), a university-high school partnership to drive sustained reform of science teaching with technology. AzSTEP is an activity of ASU's Center for Research on Education in Science, Mathematics, Engineering and Technology (CRESMET). Northern Arizona University and the University of Arizona are partners with ASU in AzSTEP.

* This article is adapted by Modeling Instruction staff from articles by James Hathaway, Media Relations Manager, and Shayna Nardi, former *State Press* student reporter, Arizona State University, Tempe, Arizona.

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The Maryland Virtual High School CoreModels Project: Harnessing Computer Modeling for Scientific Inquiry

By
Mary Ellen Verona and Susan Ragan

The Challenge

Preparing students to "do" science in the real world of the future means guiding them in "doing" science now. Just as teachers would not think about teaching biology without a microscope or chemistry without test tubes, most of today's scientists do not think about doing any kind of science without the aid of computer modeling and visualization. Since the building of a computer model requires a very intimate knowledge of the phenomenon and its interconnected parts, computer modeling often uncovers student-held misconceptions. According to College and Beranek (1992), "Computational modeling ideas and activities should have a key and central role throughout the science curriculum - not peripherally, and not only as a part of a special or optional course."

The Methods

A vital component of Maryland Virtual High School's CoreModels Project (MVHS CoreModels) is the role of the teacher in developing activities and evaluating their effectiveness in the classroom. In harmony with the standards for professional development found in the National Science Education Standards (National Research Council, 1996) and synthesized by the National Institute for Science Education (Loucks-Horsley, Stiles & Hewson, 1996), MVHS teachers work within a collegial, collaborative environment to reflect on teaching practices, facilitate change in science education, integrate theory and practice in school settings, and produce knowledge about learning and teaching.

According to Kracjik, Blumenfeld, Marx, and Soloway (1994), "The same constructivist approach recommended as a basis for classroom practice also applies to teachers. They construct their knowledge through interaction with peers, applying ideas, reflecting on the results, and implementing modifications."

Professional Development

Through summer workshops, email exchanges, and web-based sharing of materials, science teachers across the state of Maryland have formed collaborative relationships through which they discuss teaching strategies. As a result of working with computer models, teachers are asking students different questions that require the analysis of more complex situations. By looking carefully at how their students express their understanding through their written answers to the MVHS assessments, teachers are discovering student misconceptions and misunderstandings. That knowledge is driving changes in classroom instruction. Assessments are now seen as a diagnostic tool as well as an evaluation of student learning.

Student Learning

An important part of our efforts is to document the kinds of student learning that result from using modeling and visualization tools. Through the use of video analysis of student dialogue, constructed response questions scored based on the Maryland Science Rubrics, and end-of-semester exams, we are examining the impact our materials and practices have on student performance.

Learning Community

MVHS CoreModels considers itself to be a community of learners who are engaged in discovering how to improve science education through computer modeling and visualization. The stakeholders in this research effort include students, classroom teachers, district-level science leaders, boards of education, community college educators, education researchers, cognitive scientists, and computational scientists.

Activities relate to computer models designed using STELLA, a system dynamics software package. The curriculum reform standards such as the Benchmarks for Science Literacy, created by the American Association for the Advancement of Science's (AAAS) Project 2061, focus on the nature of systems in the study of science. System concepts such as equilibrium and feedback transfer not only from one science to another, but to other subjects such as social sciences. Unlike much subject specific software, STELLA is a general package that can be used to model any dynamic system so students can continue to develop expertise throughout their school career in a variety of subjects. Activities are also aligned with the expectations of the new Maryland Science Core Learning Goals. Goal 1 provides general skills applicable to all science areas. Goals 2-5 list expectations related to biology, earth science, chemistry, and physics.

The CoreModels leadership team, including the project director and eleven Maryland teachers selected as the center directors (CDs) and supporting teachers (STs) of three geographically distributed CoreModels centers, refined and piloted relevant computer models and activity packets during the 1997-1998 school year. Over fifty additional participating teachers (PTs) tested these activities in learning about modeling at summer workshops. They implemented improved versions with their students during the 1998-1999 and 1999-2000 school years. Teacher support includes content instruction, guided practice with computer skills, ideas for engaging students, and discussion of strategies for countering student difficulties. In addition to conducting traditional summer and Saturday workshops, MVHS teacher leaders visited their peers on site to help in their first implementation attempts and for subsequent debriefing sessions. Links to CoreModels curriculum pages for physics, biology, earth science and chemistry were added to the MVHS Web site. In September 2000 MVHS CoreModels was designated one of five "promising" technology projects by the U.S. Department of Education.

The Research

Funding for CoreModels was provided by the National Science Foundation through the Research on Education, Policy and Practice (REPP) program. As a research project, the CoreModels Project has investigated two questions. Can computational modeling activities help students achieve core learning goals? In order for such activities to help students, they must actually be implemented in the classrooms. Thus the CoreModels vision stressed a high rate of effective implementation. This led to our second question. Can teachers support their peers in implementing these activities? Very preliminary data suggest that common principles of good instruction such as clear objectives and prompt teacher feedback are important in fostering student learning using modeling activities. When it occurs, peer support can help teachers take charge of their own learning. Peer support or collaboration and other forms of teacher professional development must be built into the school day.

Peer Collaboration

As described above, center directors and supporting teachers met as a group several times each quarter during the first year of the project. In addition, directors

made appointments to visit activity enactment by the supporting teachers or invited them to visit the director's classroom. In addition to working out problems with the modeling activities, we were piloting the peer support component of the project. Supporting teachers understood that they would take on a mentor role during the next year. These twelve individuals (project director, CDs and STs) were highly committed to the project and were generally able to work through the difficulties involved in an assigned mentorship. Since the CDs were released half time, there was some flexibility in scheduling meetings with those they mentored. In addition, the directors had the luxury of long phone calls during year one to support each other in mentoring the supporting teachers.

The second year began with a carefully designed program of peer support, which involved pairing Supporting Teachers with Participant Teachers and encouraging regular classroom visits and discussions between each ST/PT pair. Because pairs were originally matched across schools, logistical challenges (travel time, being willing or able to miss one's own class time to visit another teacher's class) played a major role in keeping most of these relationships from developing. Unlike the center directors, who had a reduced class load, the STs had to take professional leave (paid for by the project) and arrange for a substitute. In addition, supporting teachers were uncomfortable in their role as a "mentor," especially since many Maryland districts had established mentoring relationships to help under-performing teachers. For this reason, teachers were generally unwilling to comment on or critique one another's practices, which they understood to be a primary purpose of observing one another's classrooms.

At the beginning of the second semester, directors met with supporting teachers to make mid-course corrections to the peer support paradigm. One teacher commented that:

> "The peer support portion of the project has been and continues to be a struggle. The association of classroom visits with evaluations by supervisors and administrators appears to be deeply ingrained. Teachers seem to be receptive to workshop-type sessions but less amenable to having other teachers visit. Most PT's seem to be anxious to collaborate. Workshops and regional meetings have been productive for all parties involved. In this setting, PT's seem to be more relaxed, creative, and analytical. Support seems to work better in a group situation unrelated to a classroom, more of a brainstorming session."

The second year evaluation report hypothesized that the supporting teachers might not feel capable in their role as mentor. But another teacher replied that he was comfortable in his ability to support participating teachers, but had not found a way to communicate. Several of the six participating teachers he was assigned did not return email. He said, "As a peer mentor, I do not believe that I should force myself upon the participating teachers. On the other hand, there is no way to know how the project is being implemented in the classroom if the participating teachers are not observed."

The mentors suggested several reasons for the lack of response of the new teachers:

- Teachers expect to be autonomous; another person in the room is an invasion of privacy.
- Teachers do not want to "burden" the supporting teacher without a significant need.
- The summer experience went well; participating teachers have everything they need.
- PTs do not invite others to observe since they cannot plan the computer use in advance.
- PTs don't recognize the need to document modeling activities in their classroom.

We realized that we had to reconsider interpersonal factors and explain the purpose of peer collaboration more carefully to all project participants. Instead of beginning visits to schools with classroom observation, relationships should develop first through pre-observation planning visits. Teachers might also refocus classroom observation with the ST acting as a helper and the CD observing both. Leaders also suggested post-implementation discussion of student difficulties and after school get-togethers to work on a new model or on assessment questions to supplement the modeling activity.

The main difficulty with the peer support paradigm was in scheduling visits between supporting and participating teachers. Center directors did visit participating teachers. Center directors were also extremely successful in working with teachers within their own schools. We were able to build on this success during the third year in accepting additional teachers from the current participating schools.

According to Friedman and Culp (2001), "What we did find was that teachers gradually shifted to intra-school, more informal forms of peer support, and the program followed the teachers' lead and instituted cross-discipline, within-school, team-oriented peer support structures during Year 3 of the program. This model seemed to function more productively for teachers."

For example, the five teachers who joined the project from a single school during year three provided a critical mass of interest and know-how in the school. In addition, the center director visited so often that she was considered an "adjunct faculty member." Anxiety levels were reduced when teachers saw the director planning with colleagues and teaching as well as observing in their classrooms.

Although they may not have considered themselves mentors, some of the supporting teachers demonstrated considerable leadership ability. The ST's were invaluable in facilitating small group discussions at district quarterly meetings. They developed discussion guides and other ways of providing structure and focus without inhibiting the full range of discussion issues. In addition to taking on increasingly prominent leadership roles within the project, they began outreach efforts within their schools and school districts in introducing teachers outside the project to modeling. Some became deeply involved in collaborating around modeling curriculum issues with other teachers. According to Friedman and Culp (2001), "The professional growth of this subset of program participants resulted in an expanded core group of teachers who were effectively leading the program and providing guidance to the larger cohort of teachers, strengthening an already strong group of teacher leaders and contributing to the persistent, gradual progress of the level and content of teachers' discussion of modeling over the life of the program."

Effect of Modeling on Student Learning

Each CoreModels activity was designed to meet the Maryland High School Science Core Learning Goals as well as the AAAS Project 2061 Benchmarks. At the same time that MVHS teachers were implementing these modeling activities, the Maryland State Board of Education (MSDE) was field-testing the Maryland High School Assessment (HSA) tests, the final piece of the state's systemic reform plan. The HSA includes both selected response items (e.g., multiple-choice) and constructed response items which require the analysis, synthesis, and written expression of ideas. There were early indications that CoreModels activities were effective in supporting student learning. One teacher was thrilled with the first in the district results of his students on an early test of the biology HSA. Another teacher received accolades for the outstanding results of his physics students on the Force Concept Inventory, administered as part of his concurrent participation in the Arizona modeling project.

MVHS leaders decided that constructed response items scored using the MSDE rubric would be particularly relevant to teachers and to state leaders. We would also be assisting teachers in providing practice to their students by using the constructed response mode to measure student understanding gained through modeling. Since

teachers reported that, as a result of using the materials, they saw improvement in their students' ability to meaningfully interpret the graphical representation of data and understand the ability of a model to represent real world behavior, we sought to determine whether the teacher observations listed above were actually measurable. Two open-ended questions were designed for each activity in biology and physics. The first question presented the student with a graph produced by the STELLA model used to investigate a topic recently studied and asked the student to explain its meaning. The second question asked the student to evaluate the ability of the model to represent real world behavior. Both questions would be scored using the 5-point Maryland High School Science Rubric, the same one to be used on the High School Assessment exams. In the fall of 1999, we asked for teachers who could meet the following conditions:

1. Cover three MVHS activities during the second semester and administer an assessment after each one.
2. Send the original assessments to MVHS and keep a copy to return to their students.
3. Score the copies according to the Maryland High School Science rubric.
4. Return the scored copies to the students and discuss the answers before administering the next assessment.

Eleven biology teachers and four physics teachers responded to our request. Teachers with semester-long block classes were more likely to participate since they were beginning with new students. The teachers' experience with STELLA ranged from 1 to 4 years, and the classes ranged from Basic Skills to Advanced Placement. Eleven schools were represented in the study, six rural, four suburban , and one urban. In the summer of 2000, these teachers met together with project leaders to score the assessments formally after general training and practice scoring for each topic. Each question was subjected to blind scoring by two teachers, with a third teacher resolving discrepancies.

Biology Results

Mean scores on the graph interpretation question dropped significantly ($p<0.01$) between time 1 and time 3, while mean scores on the modeling heuristic question rose significantly ($p<0.01$). The drop in scores on the graph interpretation question may be attributable to the fact that the third quiz was given at the end of the school year when student motivation was low. The results above do not include several teachers who were not able to give the third quiz. When the entire group of teachers was considered, there was an increase in graph interpretation scores from quiz 1 to quiz 2 that approached significance ($p=0.055$). The results for the question concerning the ability of a model to represent real world behavior are more promising. Even when the majority of third quizzes were given late in the school year, the mean for quiz 3 was higher than the mean for quiz 1.

Is student performance on a question type related to teacher comfort with that question type? Graph interpretation is an area in which many biology teachers have difficulty themselves in using mathematically accurate terminology. The teachers recognize this weakness in their backgrounds and are eager for more opportunities to practice graph interpretation skills with their students. Although the modeling activities provide that practice, it is possible that teacher reinforcement in classroom discussions needs to be improved in order to see steady improvement in student performance. We cannot expect to see student gains if their teachers are not clear in their own expression of the meaning of graphs.

Question 2 requires a written description of the similarities and differences between the model and the real world. Although teachers were initially uncomfortable with this question, we know from anecdotal evidence that they do become more comfortable and increase their focus on model interpretation skills after the administration of the first quiz. Therefore, the large increase in mean scores from quiz 1 to quiz 2 is at least partially attributable to increased focus on model interpretation.

Physics

As exposure to modeling activities increased, it was expected that student achievement would increase on both quiz questions. The data did not support this hypothesis. We observed that the means for the graph interpretation question went down, while the means for the model interpretation question went up. Scores on question 1 decreased between quiz 1 and 2 for some classes and between quiz 2 and 3 for others. To explore possible reasons for this discrepancy, we looked at the content of the quizzes. Question 1, which involved graph interpretation skills, appears to be more highly sensitive to the effect of content than question 2. One teacher gave eight assessments (n=24) providing the opportunity to look at the interplay between exposure to modeling activities and the difficulty of the specific topic being covered. Student performance increased significantly on both questions 1 and 2 over the first four quizzes covering kinematics-related topics. The concept of force was introduced in the firth modeling activity. For quiz 5, the student means dropped dramatically on question 1, but less so on question 2. Elevator, the topic covered on quiz 6, reinforced the concept of force. The student means on both questions 1 and 2 increased significantly. Therefore, it seems likely that the introduction of a new concept may play an important role in student assessments in spite of the number of previous exposures to modeling activities.

Although the increase in content difficulty has some explanatory value in the decrease in scores in moving from kinematics to dynamics, other factors cannot be dismissed. Question 2 required a written description of ways in which the computer model was similar to and different from the phenomenon it was meant to represent. The results there are more promising.

Summary

These results suggest that when teachers are supported by a peer-driven professional development program, they are able to integrate computer-based modeling within a range of curricular contexts to improve student understanding of some of the core scientific concepts underlying modeling as a scientific practice. Students' abilities to interpret visual representations of data seem more resistant to improvement, especially when measured over multiple content areas.

According to Friedman and Culp (2001), "One conclusion that can be inferred from these findings is that central modeling concepts, such as the heuristic relationship of models to the physical world, seem to be relatively transferable concepts that can be elaborated across curricular content areas, while interpretation of visual representations of data remains, at least in this context, a more content-dependent skill that is not easily transferred from one content area to another. These findings demonstrate that CoreModels was successful in building teachers' understanding of and ability to teach about modeling, not only as a way to explore specific content areas but as a particular conceptual approach to the task of scientific inquiry."

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Dennis Harper, PhD, directed the Generation www.Y project. Teaching in an East Los Angeles High School, he quickly saw the potential of electronic learning. In the subsequent 35 years in education, Dr. Harper has worked or visited nearly every country. After earning his doctorate in international education from the University of California at Santa Barbara in 1983 and bringing the first computers into the classrooms of 34 nations, he returned to the United States in 1992 as the technology coordinator for the Olympia School District in Washington State. In an effort to test his theories of technology infusion and staff development in a real K-12 setting, he has spent the past ten years in Olympia.

In addition to founding Generation www.Y, he has established the Generation YES (Youth and Educators Succeeding) organization, which along with the Gen www.Y program, has developed models for gender equity (Gen GIT - Girls Issues and Technology), Gen SCI (Students Caring for Infrastructure), and a program providing students the opportunity to use their technology expertise to become leaders and perform community service (Gen Did). He is also the Executive Director of the non-profit Generation Y Corporation, which provides programs that train students to provide technology expertise to community-based organizations and after-school programs. <dennis@genyes.org>

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Michael Simkins, Ed.D., was director of the Challenge 2000 Multimedia Project from 1996 to 2001. He was an elementary schoolteacher for fifteen years and an elementary school principal for nine years. Michael was named a Laureate in the Computerworld Honors "A Search for New Heroes" Archive. Michael recently assumed his new responsibilities as Creative Director of Portical.org, the Web site of California's Technology Information Center for Administrative Leadership. Born and raised in Manhattan Beach, California, Michael earned a bachelor's degree at the University of California Santa Barbara and masters and doctorate degrees at UCLA.

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Fern Tavalin

Fern Tavalin, Ed.D., is an early pioneer in the use of educational multimedia and telecommunications to improve student learning. She directs the WEB Project, Inc., a non-profit organization devoted to the development of innovative, project-based learning in the arts, humanities, and social sciences by people of all ages. Fern comes to educational technology with a background in economics, creative problem solving, student performance assessment, and participatory research. She is an avid videographer and enjoys digital editing. Together with Michael Simpkins and Karen Cole of the Challenge 2000 Multimedia Project, Fern is co-author of a forthcoming book that will be published by the Association for Supervision and Curriculum Development (ASCD) entitled *Project-based Learning with Multimedia.*

Mary Ellen Verona

Mary Ellen Verona, the Principal Investigator and Project Director of the Maryland Virtual High School CoreModels program, is currently a Co-Principal Investigator on the Education, Outreach and Training Team of the Partnership for Advanced Computational Infrastructure, funded by the National Science Foundation. After teaching computer science, mathematics and science for over fifteen years, she wrote the proposal that funded the foundation of the Maryland Virtual High School in 1994. A doctoral candidate in climate dynamics and global change at George Mason University, Mary Ellen conducts dissertation research as a Research Assistant at the Center for Ocean Land Atmosphere Studies. She earned masters' degrees in computers science and mathematics education and a bachelor's in physics.

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New Annual Publication: ERIC/IT *Web Links*

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The lead story of the November/December 2001 issue of *MultiMedia Schools* features "A GEM of a Resource: The Gateway to Educational Materials," by Marilyn Tickner with Nancy Barkhouse. A special project of the ERIC Clearinghouse on Information & Technology sponsored by the U.S. Department of Education, the Gateway to Educational Materials--or GEM--harnesses the powers of the Internet for educators. GEM provides educators with what they need: easy, fast, and free access to lesson plans, curriculum units, and other educational materials on the Internet.

To read the article and learn how GEM works and why teachers across the nation use and benefit from GEM, click here. *MultiMedia Schools*, a practical journal of technology for education, explores issues associated with using electronic information resources in K-12 schools, from the Internet, online and multimedia databases, and CD-ROM technology to computer hardware and software.

Just a sampling of publications and sites that give GEM high accolades include:

MERLOT Teacher Education Web site, designed primarily for faculty in higher education, featured GEM as a learning object of the week on its home page, summer 2001.

Technology & Learning lists GEM first in the "Web Sightings" column: "Here's your 'one stop shopping' for high quality educational resources!" (October 2001). To read article, click here.

The United Federation of Teachers' publication, *New York Teacher*, features GEM in the Web Corner column: "The federal Education Department ...sponsors another education resource that really sparkles... Last year the site averaged more than 30,000 user sessions per week. That's impressive and is one indicator that GEM meets the needs of the education community. This is a must try site for new teachers and a great resource for the rest of us" (October 24, 2001). To read article, click here.

School Library Journal: Gail Junion-Metz highlights GEM as one of the best sites for creative, high-quality lesson plans in "The Librarian's Internet" (October 2000).

New Annual Publication: ERIC/IT Web Links

Web Links, now published annually by the ERIC Clearinghouse on Information & Technology, includes some of the best educational resources available on-line.

Web Links 2001/2002: Internet Resources for Children (PDF Version)
Describing over 50 of the best educational resources available on-line for children in grades K-8, this is a terrific resource for children and their parents, teachers, and librarians to bookmark or pin up and use at home, in classrooms, and in school and

public libraries. Updated for the 2001-2002 school year from our popular *ERIC Digests* published in previous years, categories include art, current events, health, history, literature, math, reference, science, and more.

Look for a new *Web Links* publication from ERIC/IT at the start of each new school year! The 2002/2003 publication will be expanded to include internet resources for grades 9-12 and resources for library media specialists and children's librarians.

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New Books to Come in 2002

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Educational Media and Technology Yearbook
2002 Volume 27

Survey of Instructional Development Models, Fourth Edition*

Forthcoming in January
Educational Media and Technology Yearbook
2002 Volume 27
Edited by Mary Ann Fitzgerald, Michael Orey, and Robert Maribe Branch

"In the year 2001, we noted several trends in the field, some new, and others continuing from recent years. The international surge toward online education or "e-learning" continues to gain momentum. Instructional technology projects and initiatives continue to emphasize the themes of collaboration and integration. The interdisciplinary nature of this field seems to be broadening, and the borders between instructional technology, information science, and educational media, and information technology are becoming increasingly blurred. Among K-12 and higher education leaders, tension between the standards reform movement and the constructivist philosophy remains, and the debate over this issue has many implications for our field. In broader contexts, experiential education seems to be gaining importance, and designers are applying emerging technologies to create learning environments that stimulate authentic situations. Finally, over the last few years we have witnessed a changing of the guard as many prominent leaders in the field of instructional technology have retired. These developments and trends are represented in the Yearbook in the form of research studies, descriptive reports, and conceptual pieces."—*From the Preface*

Exploring current issues each year for more than a last quarter of a century, this annual volume helps media and technology professionals keep abreast of a changing and expanding field. With this 27th volume, readers will learn of the latest trends and issues, exciting projects unfolding at several research laboratories, issues of particular relevance to K-12 education, and the careers of some instructional technology leaders. And, as always, this volume provides directories of instructional technology-related organizations and institutes of higher learning offering degrees in related fields as well as an annotated list of selected current publication related to the field.

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Published annually by Libraries Unlimited in cooperation with the ERIC Clearinghouse on Information & Technology and the Association for Educational Communications and Technology (AECT).

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416 pages (ISBN 1-56308-910-6)
Cloth $80.00 ($96.00 outside North America)

Survey of Instructional Development Models, Fourth Edition*
By Kent L. Gustafson and Robert Maribe Branch
With a Foreword by Robert Reiser

Previous editions of this classic book by Gustafson and Branch have been used as required reading in instructional design classes for twenty years. This new edition, which will be published in time for fall 2002 course adoption, reflects the ways in which the instructional design (ID) field has changed in the past few years. As Robert Reiser discusses in his foreword, new ID models have been proposed, new ID procedures have been used, and the role and scope of professionals in the ID field have been greatly expanded. This new edition not only provides a brief overview of these recent trends, it also provides a brief history of ID models, an updated definition of the field, the authors' taxonomy of ID models, and the addition of several models developed in countries other than the U.S.

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To receive a New Book Announcement, which will include the month of publication, price, and information on ordering an exam copy, a review copy, or copies for your Fall 2002 course, please click here.

* Tentative title

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New and forthcoming ERIC Digests, published by the ERIC Clearinghouse on Information & Technology, include such topics as the latest issues in digital reference services; tips on dramatically improving customer satisfaction in small public libraries; the National Science Foundation's plans for a major digital library for education; knowledge management in instructional design; and competencies for online teaching.

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AVAILABLE NOW

Small Public Libraries Can Serve Big (Dec. 2001)
By Norm Parry, MLS
By borrowing strategies from successful small businesses in the private sector, defining goals, and exploiting ubiquitous low cost technologies, small public libraries can serve customer wants as well as much larger libraries. Full of practical advice, this lively and interesting ERIC Digest explores how any small library can improve customer service, make better use of available resources, and open up new service opportunities—without a bigger building, budget or book collection. The author is director of a rural upstate New York public library, one that is chartered to serve a population of 900 and where library circulation has increased from 10,000 to 45,000 in the six years under his direction.

Trends and Issues in Digital Reference Services (Nov. 2001)
By Abby S. Kasowitz, MLS
As the number of libraries and organizations that offer reference service via the Internet continues to climb, digital reference issues gain increasingly more attention within the field of librarianship. This Digest provides an overview of three key issues that have emerged recently in practice and research: provision of real-time reference service, collaborative efforts among networks of libraries and organizations, and development of quality and technical standards.

COMING SOON

The NSF National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) Program: Opportunities and Challenges for Teachers and Librarians
By Lee Zia

Integrating Knowledge Management Systems into the Design of Instruction
By J. Michael Spector and Ileana de la Teja

Competencies for Online Teaching
By J. Michael Spector and Jerry Edmonds

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